```
                PAGE,120
                TITLE   ENHANCED GRAPHICS ADAPTER BIOS
                EXTRN   CGMN:NEAR, CGDDOT:NEAR, INT_1F_1:NEAR, CGMN_FDG:NEAR
                EXTRN   END_ADDRESS: NEAR

        ;--------------------------------------------------------------
        ;       THE  BIOS ROUTINES ARE MEANT TO BE ACCESSED THROUGH     :
        ;       SOFTWARE INTERRUPTS ONLY,  ANY ADDRESSES PRESENT IN     :
        ;       THE LISTINGS  ARE INCLUDED  ONLY FOR  COMPLETENESS,     :
        ;       NOT FOR  REFERENCE.   APPLICATIONS WHICH  REFERENCE     :
        ;       ABSOLUTE   ADDRESSES   WITHIN    THE   CODE  SEGMENT    :
        ;       VIOLATE THE STRUCTURE AND DESIGN OF BIOS.               :
        ;--------------------------------------------------------------

        .LIST
C               INCLUDE         VFRONT.INC
C               SUBTTL  VFRONT.INC
C               PAGE
C
C       ;--- INT 10 ------------------------------------------------------------
C       ; VIDEO_IO                                                           :
C       ;       THESE ROUTINES PROVIDE THE CRT INTERFACE                     :
C       ;       THE FOLLOWING FUNCTIONS ARE PROVIDED:                        :
C       ;       (AH)=0 SET  MODE (AL) CONTAINS MODE VALUE                    :
C       ;                                                                    :
C       ;       AL AD   TYPE    RES       NOTES  DF-DIM  DISPLAY      MAX PGS  :
C       ;       ---------------------------------------------------------    :
C       ;     *  0 B8   ALPHA   640X200          40X25   COLOR - BW      8     :
C       ;        1 B8   ALPHA   640X200          40X25   COLOR           8     :
C       ;     *  2 B8   ALPHA   640X200          80X25   COLOR - BW      8     :
C       ;        3 B8   ALPHA   640X200          80X25   COLOR           8     :
C       ;        4 B8   GRPHX   320X200          40X25   COLOR           1     :
C       ;        5 B8   GRPHX   320X200          40X25   COLOR - BW      1     :
C       ;        6 B8   GRPHX   640X200          80X25   COLOR - BW      1     :
C       ;     *  7 B0   ALPHA   720X350          80X25   MONOCHROME      8     :
C       ;                                                                    :
C       ;        8      RESERVED                                             :
C       ;        9      RESERVED                                             :
C       ;        A      RESERVED                                             :
C       ;        B      RESERVED - INTERNAL USE                              :
C       ;        C      RESERVED - INTERNAL USE                              :
C       ;                                                                    :
C       ;        D A0   GRPHX   320X200          40X25   COLOR           8     :
C       ;        E A0   GRPHX   640X200          80X25   COLOR           4     :
C       ;        F A0   GRPHX   640X350          80X25   MONOCHROME      2     :
C       ;       10 A0   GRPHX   640X350          80X25   HI RES          2     :
C       ;                                                                    :
C       ;                                                                    :
C       ;               NOTE : HIGH BIT AL SET PREVENTS REGEN BUFFER CLEAR ON :
C       ;                      MODES RUNNING ON THE COMBO VIDEO ADAPTER       :
C       ;                                                                    :
C       ;               *** NOTE BW MODES OPERATE SAME AS COLOR MODES, BUT    :
C       ;                     COLOR BURST IS NOT ENABLED                     :
C       ;       (AH)=1  SET CURSOR TYPE                                      :
C       ;               (CH) =  BITS 4-0 = START LINE FOR CURSOR             :
C       ;                       ** HARDWARE WILL ALWAYS CAUSE BLINK          :
C       ;                       ** SETTING BIT 5 OR 6 WILL CAUSE ERRATIC     :
C       ;                          BLINKING OR NO CURSOR AT ALL              :
C       ;               (CL) =  BITS 4-0 = END LINE FOR CURSOR               :
C       ;       (AH)=2  SET CURSOR POSITION                                  :
C       ;               (DH,DL) = ROW,COLUMN  (0,0) IS UPPER LEFT            :
C       ;               (BH) = PAGE NUMBER                                   :
C       ;       (AH)=3  READ CURSOR POSITION                                 :
C       ;               (BH) = PAGE NUMBER                                   :
C       ;               ON EXIT (DH,DL) = ROW,COLUMN OF CURRENT CURSOR       :
C       ;                       (CH,CL) = CURSOR MODE CURRENTLY SET          :
C       ;       (AH)=4  READ LIGHT PEN POSITION                              :
C       ;               ON EXIT:                                             :
C       ;               (AH) = 0 -- LIGHT PEN SWITCH NOT DOWN/NOT TRIGGERED  :
C       ;               (AH) = 1 -- VALID LIGHT PEN VALUE IN REGISTERS       :
C       ;                       (DH,DL) = ROW,COLUMN OF CHARACTER LP POSN    :
C       ;                       (CH) = RASTER LINE (0-199)                   :
C       ;                       (CX) = RASTER LINE (Q=NNN) NEW GRAPHICS MODES :
C       ;                       (BX) = PIXEL COLUMN (0-319,639)              :
C       ;       (AH)=5  SELECT ACTIVE DISPLAY PAGE                           :
C       ;               (AL) = NEW PAGE VALUE, SEE AH=0 FOR PAGE INFO        :
C       ;       (AH)=6  SCROLL ACTIVE PAGE UP                                :
C       ;               (AL) = NUMBER OF LINES, INPUT LINES BLANKED AT BOTTOM :
C       ;                      OF WINDOW                                     :
C       ;                       AL = 0 MEANS BLANK ENTIRE WINDOW             :
C       ;               (CH,CL) = ROW,COLUMN OF UPPER LEFT CORNER OF SCROLL  :
C       ;               (DH,DL) = ROW,COLUMN OF LOWER RIGHT CORNER OF SCROLL :
C       ;               (BH) = ATTRIBUTE TO BE USED ON BLANK LINE            :
C       ;       (AH)=7  SCROLL ACTIVE PAGE DOWN                              :
C       ;               (AL) = NUMBER OF LINES, INPUT LINES BLANKED AT TOP   :
C       ;                      OF WINDOW                                     :
C       ;                       AL = 0 MEANS BLANK ENTIRE WINDOW             :
C       ;               (CH,CL) = ROW,COLUMN OF UPPER LEFT CORNER OF SCROLL  :
C       ;               (DH,DL) = ROW,COLUMN OF LOWER RIGHT CORNER OF SCROLL :
C       ;               (BH) = ATTRIBUTE TO BE USED ON BLANK LINE            :
C       ;                                                                    :
C       ;       CHARACTER HANDLING ROUTINES                                  :
C       ;                                                                    :
C       ;       (AH) = 8 READ ATTRIBUTE/CHARACTER AT CURRENT CURSOR POSITION :
C       ;               (BH) = DISPLAY PAGE                                  :
C       ;               ON EXIT:                                             :
C       ;               (AL) = CHAR READ                                     :
C       ;               (AH) = ATTRIBUTE OF CHARACTER READ (ALPHA MODES ONLY) :
C       ;       (AH) = 9 WRITE ATTRIBUTE/CHARACTER AT CURRENT CURSOR POSITION :
C       ;               (BH) = DISPLAY PAGE                                  :
C       ;               (CX) = COUNT OF CHARACTERS TO WRITE                  :
C       ;               (AL) = CHAR TO WRITE                                 :
C       ;               (BL) = ATTRIBUTE OF CHARACTER (ALPHA)/COLOR OF CHAR  :
C       ;                      (GRAPHICS)                                    :
C       ;                       SEE NOTE ON WRITE DOT FOR BIT 7 OF BL = 1.   :
C       ;       (AH) = A  WRITE CHARACTER ONLY AT CURRENT CURSOR POSITION    :
C       ;               (BH) = DISPLAY PAGE                                  :
C       ;               (CX) = COUNT OF CHARACTERS TO WRITE                  :
C       ;               (AL) = CHAR TO WRITE                                 :
C       ;       FOR READ/WRITE CHARACTER INTERFACE WHILE IN GRAPHICS MODE, THE :
C       ;               CHARACTERS ARE FORMED FROM A CHARACTER GENERATOR IMAGE :
C       ;               MAINTAINED IN THE SYSTEM ROM. ONLY THE 1ST 128 CHARS  :
C       ;               ARE CONTAINED THERE. TO READ/WRITE THE SECOND 128     :
C       ;               CHARS, THE USER MUST INITIALIZE THE POINTER AT        :
C       ;               INTERRUPT 1FH (LOCATION 00007CH) TO POINT TO THE 1K BYTE :
C       ;               TABLE CONTAINING THE CODE POINTS FOR THE SECOND       :
C       ;               128 CHARS (128-255).                                 :
C       ;                                                                    :
C       ;               FOR THE NEW GRAPHICS MODES 256 GRAPHICS CHARS ARE    :
C       ;               SUPPLIED IN THE SYSTEM ROM.                          :
C       ;                                                                    :
C       ;       FOR WRITE CHARACTER INTERFACE IN GRAPHICS MODE, THE REPLICATION :
C       ;               FACTOR CONTAINED IN (CX) ON ENTRY WILL PRODUCE VALID  :
C       ;               RESULTS ONLY FOR CHARACTERS CONTAINED ON THE SAME ROW. :
C       ;               CONTINUATION TO SUCCEEDING LINES WILL NOT PRODUCE     :
C       ;               CORRECTLY.                                           :
```

```
C ;                                                                    :
C ;       GRAPHICS INTERFACE                                           :
C ;       (AH) = B  SET COLOR PALETTE                                  :
C ;              FOR USE IN COMPATIBILITY MODES                        :
C ;              (BH) = PALETTE COLOR ID BEING SET (0-127)             :
C ;              (BL) = COLOR VALUE TO BE USED WITH THAT COLOR ID      :
C ;                 NOTE: FOR THE CURRENT COLOR CARD, THIS ENTRY POINT :
C ;                       HAS MEANING ONLY FOR 320X200 GRAPHICS.       :
C ;                     COLOR ID = 0 SELECTS THE BACKGROUND COLOR (0-15):
C ;                     COLOR 1D = 1 SELECTS THE PALETTE TO BE USED:   :
C ;                             0 = GREEN(1)/RED(2)/BROWN(3)           :
C ;                             1 = CYAN(1)/MAGENTA(2)/WHITE(3)        :
C ;                     IN 40X25 OR 80X25 ALPHA MODES, THE VALUE SET   :
C ;                             FOR PALETTE COLOR 0 INDICATES THE      :
C ;                             BORDER COLOR TO BE USED (VALUES 0-31,  :
C ;                             WHERE 16-31 SELECT THE HIGH NTENSITY   :
C ;                             BACKGROUND SET).                       :
C ;       (AH) = C  WRITE DOT                                          :
C ;              (BH) = PAGE                                           :
C ;              (DX) = ROW NUMBER                                     :
C ;              (CX) = COLUMN NUMBER                                  :
C ;              (AL) = COLOR VALUE                                    :
C ;                      IF BIT 7 OF AL = 1, THEN THE COLOR VALUE IS   :
C ;                      EXCLUSIVE OR'D WITH THE CURRENT CONTENTS OF   :
C ;                      THE DOT                                       :
C ;       (AH) = D  READ DOT                                           :
C ;              (BH) = PAGE                                           :
C ;              (DX) = ROW NUMBER                                     :
C ;              (CX) = COLUMN NUMBER                                  :
C ;              (AL) RETURNS THE DOT READ                             :
C ;                                                                    :
C ; ASCII TELETYPE ROUTINE FOR OUTPUT                                  :
C ;                                                                    :
C ;       (AH) = E  WRITE TELETYPE TO ACTIVE PAGE                      :
C ;              (AL) = CHAR TO WRITE                                  :
C ;              (BL) = FOREGROUND COLOR IN GRAPHICS MODE              :
C ;              NOTE -- SCREEN WIDTH IS CONTROLLED BY PREVIOUS MODE SET :
C ;                                                                    :
C ;       (AH) = F  CURRENT VIDEO STATE                                :
C ;              RETURNS THE CURRENT VIDEO STATE                       :
C ;              (AL) = MODE CURRENTLY SET (SEE AH=0 FOR EXPLANATION)  :
C ;              (AH) = NUMBER OF CHARACTER COLUMNS ON SCREEN           :
C ;              (BH) = CURRENT ACTIVE DISPLAY PAGE                    :
C ;                                                                    :
C ;       (AH) = 10  SET PALETTE REGISTERS                             :
C ;                                                                    :
C ;              (AL) = 0         SET INDIVIDUAL PALETTE REGISTER      :
C ;               BL = PALETTE REGISTER TO BE SET                      :
C ;               BH = VALUE TO SET                                    :
C ;                                                                    :
C ;              AL = 1         SET OVERSCAN REGISTER                 :
C ;              BH = VALUE TO SET                                     :
C ;                                                                    :
C ;              AL = 2         SET ALL PALETTE REGISTERS AND OVERSCAN :
C ;              ES:DX POINTS TO A 17 BYTE TABLE                       :
C ;              BYTES 0 - 15 ARE THE PALETTE VALUES, RESPECTIVELY     :
C ;              BYTE 16 IS THE OVERSCAN VALUE                         :
C ;                                                                    :
C ;              AL = 3           TOGGLE INTENSIFY/BLINKING BIT        :
C ;                     BL - 0  ENABLE INTENSIFY                       :
C ;                     BL - 1  ENABLE BLINKING                        :
C ;                                                                    :
C ;       (AH) = 11  CHARACTER GENERATOR ROUTINE                       :
C ;              NOTE : THIS CALL WILL INITIATE A MODE SET, COMPLETELY  :
C ;                     RESETTING THE VIDEO ENVIRONMENT BUT MAINTAINING :
C ;                     THE REGEN BUFFER,                              :
C ;                                                                    :
C ;              AL = 00   USER ALPHA LOAD                             :
C ;                     ES:BP - POINTER TO USER TABLE                  :
C ;                     CX    - COUNT TO STORE                         :
C ;                     DX    - CHARACTER OFFSET INTO TABLE            :
C ;                     BL    - BLOCK TO LOAD                          :
C ;                     BH    - NUMBER OF BYTES PER CHARACTER          :
C ;              AL = 01   ROM MONOCHROME SET                          :
C ;                     BL    - BLOCK TO LOAD                          :
C ;              AL = 02   ROM 8X8 DOUBLE DOT                          :
C ;                     BL    - BLOCK TO LOAD                          :
C ;              AL = 03   SET BLOCK SPECIFIER                         :
C ;                     BL    - CHAR GEN BLOCK SPECIFIER               :
C ;                             D3-D2 ATTR BIT.3 ONE, CHAR GEN 0-3     :
C ;                             D1-D0 ATTR BIT 3 ZERO, CHAR GEN 0-3    :
C ;                     NOTE : WHEN USING AL = 03 A FUNCTION CALL      :
C ;                             AX = 1000H                             :
C ;                             BX = 0712H                             :
C ;                             IS RECOMMENDED TO SET THE COLOR PLANES :
C ;                             RESULTING IN 512 CHARACTERS AND EIGHT  :
C ;                                    CONSISTENT COLORS.              :
C ;                                                                    :
C ;       NOTE : THE FOLLOWING INTERFACE (AL=1X) IS SIMILAR IN FUNCTION :
C ;              TO (AL=0X) EXCEPT THAT :                              :
C ;                     - PAGE ZERO MUST BE ACTIVE                     :
C ;                     - POINTS (BYTES/CHAR) WILL BE RECALCULATED     :
C ;                     - ROWS WILL BE CALCULATED FROM THE FOLLOWING:  :
C ;                             INT(200 OR 350) / POINTS) - 1          :
C ;                     - CRT_LEN WILL BE CALCULATED FROM :            :
C ;                             (ROWS + 1) * CRT_COLS * 2              :
C ;                     - THE CRTC WILL BE REPROGRAMMED AS FOLLOWS :   :
C ;                             R09H = POINTS = 1       MAX SCAN LINE  :
C ;                                    R09H DONE ONLY IN MODE 7        :
C ;                             R0AH = POINTS - 2       CURSOR START   :
C ;                             R0BH = 0                CURSOR END     :
C ;                             R12H =                  VERT DISP END  :
C ;                                  [(ROWS + 1) * POINTS] = 1         :
C ;                             R14H = POINTS           UNDERLINE LOC  :
C ;                                                                    :
C ;              THE ABOVE REGISTER CALCULATIONS MUST BE CLOSE TO THE  :
C ;              ORIGINAL TABLE VALUES OR UNDETERMINED RESULTS WILL    :
C ;              OCCUR.                                                :
C ;                                                                    :
C ;              NOTE : THE FOLLOWING INTERFACE IS DESIGNED TO BE      :
C ;                     CALLED ONLY IMMEDIATELY AFTER A MODE SET HAS   :
C ;                     BEEN ISSUED. FAILURE TO ADHERE TO THIS PRACTICE :
C ;                     MAY CAUSE UNDETERMINED RESULTS.                :
C ;              AL = 10  USER ALPHA LOAD                              :
C ;                                                                    :
C ;                     ES:BP - POINTER TO USER TABLE                  :
C ;                     CX    - COUNT TO STORE                         :
C ;                     DX    - CHARACTER OFFSET INTO TABLE            :
C ;                     BL    - BLOCK TO LOAD                          :
C ;                     BH    - NUMBER OF BYTES PER CHARACTER          :
C ;              AL = 11   ROM MONOCHROME SET                          :
C ;                     BL    - BLOCK TO LOAD                          :
C ;              AL = 12   ROM 8X8 DOUBLE DOT                          :
C ;                     BL    - BLOCK TO LOAD                          :
C ;                                                                    :
C ;                                                                    :
```

```
                                253      C  ;               NOTE : THE FOLLOWING INTERFACE IS DESIGNED TO BE         :
                                254      C  ;                      CALLED ONLY IMMEDIATELY AFTER A MODE SET HAS     :
                                255      C  ;                      BEEN ISSUED. FAILURE TO ADHERE TO THIS PRACTICE  :
                                256      C  ;                      MAY CAUSE UNDETERMINED RESULTS.                  :
                                257      C  ;                                                                       :
                                258      C  ;               AL = 20   USER GRAPHICS CHARS INT 01FH (8X8)            :
                                259      C  ;                      ES:BP - POINTER TO USER TABLE                    :
                                260      C  ;               AL = 21  USER GRAPHICS CHARS                            :
                                261      C  ;                      ES:BP - POINTER TO USER TABLE                    :
                                262      C  ;                      CX    - POINTS (BYTES PER CHARACTER)             :
                                263      C  ;                      BL    - ROW SPECIFIER                            :
                                264      C  ;                                                                       :
                                265      C  ;                              BL = 0  USER                             :
                                266      C  ;                                      DL - ROWS                        :
                                267      C  ;                              BL = 1  14 (0EH)                         :
                                268      C  ;                              BL = 2  25 (19H)                         :
                                269      C  ;                              BL = 3  43 (2BH)                         :
                                270      C  ;                                                                       :
                                271      C  ;               AL = 22   ROM 8 X 14 SET                                :
                                272      C  ;                      BL    - ROW SPECIFIER                            :
                                273      C  ;               AL = 23   ROM 8 X 8 DOUBLE DOT                          :
                                274      C  ;                      BL    - ROW SPECIFIER                            :
                                275      C  ;                                                                       :
                                276      C  ;                                                                       :
                                277      C  ;               AL = 30   INFORMATION                                   :
                                278      C  ;                              CX    - POINTS                           :
                                279      C  ;                              DL    - ROWS                             :
                                280      C  ;                      BH    - 0       RETURN CURRENT INT 1FH PTR       :
                                281      C  ;                              ES:BP - PTR TO TABLE                     :
                                282      C  ;                      BH    - 1       (RETURN CURRENT INT 44H PTR      :
                                283      C  ;                              ES:BP - PTR TO TABLE                     :
                                284      C  ;                      BH    - 2       RETURN ROM 8 X 14 PTR            :
                                285      C  ;                              ES:BP - PTR TO TABLE                     :
                                286      C  ;                      BH    - 3       RETURN ROM DOUBLE DOT PTR        :
                                287      C  ;                              ES:BP - PTR TO TABLE                     :
                                288      C  ;                      BH    - 4       RETURN ROM DOUBLE DOT PTR (TOP)  :
                                289      C  ;                              ES:BP - PTR TO TABLE                     :
                                290      C  ;                      BH    - 5       RETURN ROM ALPHA ALTERNATE 9X14  :
                                291      C  ;                              ES:BP - PTR TO TABLE                     :
                                292      C  ;                                                                       :
                                293      C  ;           (AH) = 12   ALTERNATE SELECT                                :
                                294      C  ;                                                                       :
                                295      C  ;               BL = 10  RETURN EGA INFORMATION                         :
                                296      C  ;                      BH = 0 - COLOR MODE IN EFFECT <3><D><X>          :
                                297      C  ;                           1 - MONOC MODE IN EFFECT <3><B><X>          :
                                298      C  ;                      BL = MEMORY VALUE                                :
                                299      C  ;                              0 0 - 064K      0 1 - 128K               :
                                300      C  ;                              1 0 - 192K      1 1 - 256K               :
                                301      C  ;                      CH = FEATURE BITS                                :
                                302      C  ;                      CL = SWITCH SETTING                              :
                                303      C  ;                                                                       :
                                304      C  ;               BL = 20 SELECT ALTERNATE PRINT SCREEN ROUTINE            :
                                305      C  ;                                                                       :
                                306      C  ;            (AH) = 13  WRITE STRING                                    :
                                307      C  ;                      ES:BP - POINTER TO STRING TO BE WRITTEN          :
                                308      C  ;                      CX    - CHARACTER ONLY COUNT                     :
                                309      C  ;                      DX    - POSITION TO BEGIN STRING, IN CURSOR      :
                                310      C  ;                              TERMS                                    :
                                311      C  ;                      BH    - PAGE NUMBER                              :
                                312      C  ;                                                                       :
                                313      C  ;               AL = 0                                                  :
                                314      C  ;                      BL    - ATTRIBUTE                                :
                                315      C  ;                      STRING - (CHAR, CHAR, CHAR, ...)                 :
                                316      C  ;                      CURSOR NOT MOVED                                 :
                                317      C  ;               AL = 1                                                  :
                                318      C  ;                      BL    - ATTRIBUTE                                :
                                319      C  ;                      STRING - (CHAR, CHAR, CHAR, ...)                 :
                                320      C  ;                      CURSOR IS MOVED                                  :
                                321      C  ;               AL = 2                                                  :
                                322      C  ;                      STRING - (CHAR, ATTR, CHAR, ATTR, ...)           :
                                323      C  ;                      CURSOR NOT MOVED                                 :
                                324      C  ;               AL = 3                                                  :
                                325      C  ;                      STRING = (CHAR, ATTR, CHAR, ATTR, ...)           :
                                326      C  ;                      CURSOR IS MOVED                                  :
                                327      C  ;                                                                       :
                                328      C  ;               NOTE : CHAR RET, LINE FEED, BACKSPACE, AND BELL ARE     :
                                329      C  ;                      TREATED AS COMMANDS RATHER THAN PRINTABLE        :
                                330      C  ;                      CHARACTERS.                                      :
                                331      C  ;                                                                       :
                                332      C  ;---------------------------------------------------------------------------
                                333      C
                                334      C  SRLOAD   MACRO   SEGREG,VALUE
                                335      C           IFNB <VALUE>
                                336      C           IFIDN <VALUE>,<0>
                                337      C           SUB     DX,DX
                                338      C           ELSE
                                339      C           MOV     DX,VALUE
                                340      C           ENDIF
                                341      C           ENDIF
                                342      C           MOV     SEGREG,DX
                                343      C           ENDM
                                344      C
                                345      C
                                346      C  ;----- LOW MEMORY SEGMENT
                                347      C
0000                            348      C  ABS0     SEGMENT AT      0
0014                            349      C           ORG     005H*4                          ; PRINT SCREEN VECTOR
0014                            350      C  INT5_PTR         LABEL   DWORD
0040                            351      C           ORG     010H*4                          ; VIDEO I/O VECTOR
0040                            352      C  VIDEO            LABEL   DWORD
007C                            353      C           ORG     01FH*4                          ; GRAPHIC CHARS 128-255
007C                            354      C  EXT_PTR          LABEL   DWORD
                                355      C
0108                            356      C           ORG     042H*4                          ; REVECTORED 10H*4
0108                            357      C  PLANAR_VIDEO     LABEL   DWORD
                                358      C
010C                            359      C           ORG     043H*4                          ; GRAPHIC CHARS 0-255
010C                            360      C  GRX_SET          LABEL   DWORD
                                361      C
0410                            362      C           ORG     0410H
0410                            363      C  EQUIP_LOW        LABEL   BYTE
0410  ????                      364      C  EQUIP_FLAG       DW      ?
                                365      C
                                366      C  ;----- REUSE RAM FROM PLANAR BIOS
                                367      C
0449                            368      C           ORG     0449H
0449  ??                        369      C  CRT_MODE         DB      ?
044A  ????                      370      C  CRT_COLS         DW      ?
044C  ????                      371      C  CRT_LEN          DW      ?
044E  ????                      372      C  CRT_START        DW      ?
0450     08 [                   373      C  CURSOR_POSN      DW      8 DUP(7)
               0007             374      C
                     ]          375      C
                                376      C
0460  0007                      377      C  CURSOR_MODE      DW      7
0462  ??                        378      C  ACTIVE_PAGE      DB      ?
```

```
0463  ????                379     C  ADDR_6845       DW      ?
0465  ??                  380     C  CRT_MODE_SET    DB      ?
0466  ??                  381     C  CRT_PALETTE     DB      ?
                          382     C
0472                      383     C           ORG    0472H
0472  ????                384     C  RESET_FLAG      DW      ?
0484                      385     C          ORG     0484H
0484  ??                  386     C  ROWS    DB      ?                               ; ROWS ON THE SCREEN
0485  ????                387     C  POINTS  DW      ?                               ; BYTES PER CHARACTER
                          388     C
0487  ??                  389     C  INFO    DB      ?
                          390     C
                          391     C  ; INFO
                          392     C  ;       D7 - HIGH BIT OF MODE SET, CLEAR/NOT CLEAR REGEN
                          393     C  ;       D6 - MEMORY  D6 D5 = 0 0 - 064K    0 1 - 128K
                          394     C  ;       D5 - MEMORY          1 0 - 192K    1 1 - 256K
                          395     C  ;       D4 - RESERVED
                          396     C  ;       D3 - EGA ACTIVE MONITOR (0), EGA NOT ACTIVE (1)
                          397     C  ;       D2 - WAIT FOR DISPLAY ENABLE (1)
                          398     C  ;       D1 - EGA HAS A MONOCHROME ATTACHED (1)
                          399     C  ;       D0 - SET C_TYPE EMULATE ACTIVE (0)
                          400     C
0488  ??                  401     C  INFO_3  DB      ?
                          402     C
                          403     C  ; INFO_3
                          404     C  ;       D7-D4   FEATURE BITS
                          405     C  ;       D3-D0   SWITCHES
                          406     C
04A8                      407     C          ORG     04A8H
04A8                      408     C  SAVE_PTR        LABEL   DWORD
                          409     C
                          410     C  ;----- SAVE_PTR
                          411     C  ;
                          412     C  ;       SAVE_PTR IS A POINTER TO A TABLE AS DESCRIBED AS FOLLOWS :
                          413     C  ;
                          414     C  ;       DWORD_1         VIDEO PARAMETER TABLE POINTER
                          415     C  ;       DWORD_2         DYNAMIC SAVE AREA POINTER
                          416     C  ;       DWORD_3         ALPHA MODE AUXILIARY CHAR GEN POINTER
                          417     C  ;       DWORD_4         GRAPHICS MODE AUXILIARY CHAR GEN POINTER
                          418     C  ;       DWORD_5         RESERVED
                          419     C  ;       DWORD_6         RESERVED
                          420     C  ;       DWORD_7         RESERVED
                          421     C  ;
                          422     C  ;       DWORD_1         PARAMETER TABLE POINTER
                          423     C  ;                       INITIALIZED TO BIOS EGA PARAMETER TABLE.
                          424     C  ;                       THIS VALUE MUST EXIST.
                          425     C  ;
                          426     C  ;       DWORD_2         PARAMETER SAVE AREA POENTER
                          427     C  ;                       INITIALIZED TO 0000:0000, THIS VALUE IS OPTIONAL.
                          428     C  ;                       WHEN NON-ZERO, THIS POINTER WILL BE USED AS POINTER
                          429     C  ;                       TO A RAM AREA WHERE CERTAIN DYNAMIC VALUES ARE TO
                          430     C  ;                       BE SAVED. WHEN IN EGA OPERATION THIS RAM AREA WILL
                          431     C  ;                       HOLD THE 16 EGA PALETTE REGISTER VALUES PLUS
                          432     C  ;                       THE OVERSCAN VALUE IN BYTES 0-16D RESPECTIVELY.
                          433     C  ;                       AT LEAST 256 BYTES MUST BE ALLOCATED FOR THIS AREA,
                          434     C  ;
                          435     C  ;       DWORD_3         ALPHA MODE AUXILIARY POINTER
                          436     C  ;                       INITIALIZED TO 0000:0000, THIS VALUE IS OPTIONAL.
                          437     C  ;                       WHEN NON=ZERO, THIS POINTER IS USED AS A POINTER
                          438     C  ;                       TO A TABLES DESCRIBED AS FOLLOWS :
                          439     C  ;
                          440     C  ;                       BYTE    BYTES/CHARACTER
                          441     C  ;                       BYTE    BLOCK TO LOAD, SHOULD BE ZERO FOR NORMAL
                          442     C  ;                               OPERATION
                          443     C  ;                       WORD    COUNT TO STORE, SHOULD BE 256D FOR NORMAL
                          444     C  ;                               OPERATION
                          445     C  ;                       WORD    CHARACTER OFFSET, SHOULD BE ZERO FOR NORMAL
                          446     C  ;                               OPERATION
                          447     C  ;                       DWORD   POINTER TO A FONT TABLE
                          448     C  ;                       BYTE    DISPLAYABLE ROWS
                          449     C  ;                               IF FF THE MAXIMUM CALCULATED VALUE WILL BE
                          450     C  ;                               USED, ELSE THIS VALUE WILL BE USED
                          451     C  ;                       BYTE    CONSECUTIVE BYTES OF MODE VALUES FOR WHICH
                          452     C  ;                               THIS FONT DESCRIPTION IS TO BE USED.
                          453     C  ;                               THE END OF THIS STREAM IS INDICATED BY A
                          454     C  ;                               BYTE CODE OF 'FF'
                          455     C  ;
                          456     C  ;                       NOTE : USE OF THIS POINTER MAY CAUSE UNEXPECTED
                          457     C  ;                              CURSOR TYPE OPERATION. FOR AN EXPLANATION
                          458     C  ;                              OF CURSOR TYPE SEE AH = 01 IN THE INTERFACE
                          459     C  ;                              SECTION,
                          460     C  ;
                          461     C  ;       DWORD_4         GRAPHICS MODE AUXILIARY POINTER
                          462     C  ;                       INITIALIZED TO 0000:0000, THIS VALUE IS OPTIONAL.
                          463     C  ;                       WHEN NON-ZERO, THIS POINTER IS USED AS A POINTER
                          464     C  ;                       TO A TABLES DESCRIBED AS FOLLOWS :
                          465     C  ;
                          466     C  ;                       BYTE    DISPLAYABLE ROWS
                          467     C  ;                       WORD    BYTES PER CHARACTER
                          468     C  ;                       DWORD   POINTER TO A FONT TABLE
                          469     C  ;                       BYTE    CONSECUTIVE BYTES OF MODE VALUES FOR WHICH
                          470     C  ;                               THIS FONT DESCRIPTION IS TO BE USED.
                          471     C  ;                               THE END OF THIS STREAM IS INDICATED BY A
                          472     C  ;                               BYTE CODE OF 'FF'
                          473     C  ;
                          474     C  ;       DWORD_5 THRU DWORD_7
                          475     C  ;                       RESERVED AND SET TO 0000:0000.
                          476     C  ;
                          477     C
0500                      478     C          ORG     0500H
0500  ??                  479     C  STATUS_BYTE     DB      ?
0501                      480     C  ABS0    ENDS
                          481     C
= 0061                    482     C  PORT_B          EQU     61H                     ; 8255 PORT B ADDR
= 0040                    483     C  TIMER           EQU     40H
                          484     C
                          485     C  ;----- EQUATES FOR CARD PORT ADDRESSES
                          486     C
= 00C4                    487     C          SEQ_ADDR        EQU     0C4H
= 00C5                    488     C          SEQ_DATA        EQU     0C5H
= 00D4                    489     C          CRTC_ADDR       EQU     0D4H
= 00B4                    490     C          CRTC_ADDR_B     EQU     0B4H
= 00D5                    491     C          CRTC_DATA       EQU     0D5H            ; OR 0B5H
= 00CC                    492     C          GRAPH_1_POS     EQU     0CCH
= 00CA                    493     C          GRAPH_2_POS     EQU     0CAH
= 00CE                    494     C          GRAPH_ADDR      EQU     0CEH
= 00CF                    495     C          GRAPH_DATA      EQU     0CFH
= 00C2                    496     C          MISC_OUTPUT     EQU     0C2H
= 00C2                    497     C          IN_STAT_O       EQU     0C2H
= 00BA                    498     C          INPUT_STATUS_B  EQU     0BAH
= 00DA                    499     C          INPUT_STATUS    EQU     0DAH
= 00DA                    500     C          ATTR_READ       EQU     0DAH
= 00C0                    501     C          ATTR_WRITE      EQU     0C0H
                          502     C
                          503     C  ;----- EQUATES FOR ADDRESS REGISTER VALUES
                          504     C
```

```
= 0000                  505      C          S_RESET          EQU     00H
= 0001                  506      C          S_CLOCK          EQU     01H
= 0002                  507      C          S_MAP            EQU     02H
= 0003                  508      C          S_CGEN           EQU     03H
= 0004                  509      C          S_MEM            EQU     04H
                        510      C
= 0000                  511      C          C_HRZ_TOT        EQU     00H
= 0001                  512      C          C_HRZ_DSP        EQU     01H
= 0002                  513      C          C_STRT_HRZ_BLK   EQU     02H
= 0003                  514      C          C_END_HRZ_BLK    EQU     03H
= 0004                  515      C          C_STRT_HRZ_SYN   EQU     04H
= 0005                  516      C          C_END_HRZ_SYN    EQU     05H
= 0006                  517      C          C_VRT_TOT        EQU     06H
= 0007                  518      C          C_OVERFLOW       EQU     07H
= 0008                  519      C          C_PRE_ROW        EQU     08H
= 0009                  520      C          C_MAX_SCAN_LN    EQU     09H
= 000A                  521      C          C_CRSR_START     EQU     0AH
= 000B                  522      C          C_CRSR_END       EQU     0BH
= 000C                  523      C          C_STRT_HGH       EQU     0CH
= 000D                  524      C          C_STRT_LOW       EQU     0DH
= 000E                  525      C          C_CRSR_LOC_HGH   EQU     0EH
= 000F                  526      C          C_CRSR_LOC_LOW   EQU     0FH
= 0010                  527      C          C_VRT_SYN_STRT   EQU     10H             ; WRITE ONLY
= 0010                  528      C          C_LGHT_PEN_HGH   EQU     10H             ; READ ONLY
= 0011                  529      C          C_VRT_SYN_END    EQU     11H             ; WRITE ONLY
= 0011                  530      C          C_LGHT_PEN_LOW   EQU     11H             ; READ ONLY
= 0012                  531      C          C_VRT_DSP_END    EQU     12H
= 0013                  532      C          C_OFFSET         EQU     13H
= 0014                  533      C          C_UNDERLN_LOC    EQU     14H
= 0015                  534      C          C_STRT_VRT_BLK   EQU     15H
= 0016                  535      C          C_END_VRT_BLK    EQU     16H
= 0017                  536      C          C_MODE_CNTL      EQU     17H
= 0018                  537      C          C_LN_COMP        EQU     18H
                        538      C
= 0000                  539      C          G_SET_RESET      EQU     00H
= 0001                  540      C          G_ENBL_SET       EQU     01H
= 0002                  541      C          G_CLR_COMP       EQU     02H
= 0003                  542      C          G_DATA_ROT       EQU     03H
= 0004                  543      C          G_READ_MAP       EQU     04H
= 0005                  544      C          G_MODE           EQU     05H
= 0006                  545      C          G_MISC           EQU     06H
= 0007                  546      C          G_COLOR          EQU     07H
= 0008                  547      C          G_BIT_MASK       EQU     08H
                        548      C
= 0010                  549      C          P_MODE           EQU     10H
= 0011                  550      C          P_OVERSC         EQU     11H
= 0012                  551      C          P_CPLANE         EQU     12H
= 0013                  552      C          P_HPEL           EQU     13H
                        553      C
                        554      C          SUBTTL
                        555
                        556          ;----- CODE SEGMENT
                        557
0000                    558          CODE    SEGMENT PUBLIC
                        559
                        560      C          INCLUDE         VPOST.INC
                        561      C          SUBTTL  VPOST.INC
                        562      C          PAGE
                        563      C
                        564      C  ;----- POST
                        565      C
                        566      C          ASSUME CS:CODE, DS:ABS0
0000                    567      C          ORG     0H
0000  55                568      C          DB      055H                            ; SIGNATURE
0001  AA                569      C          DB      0AAH                            ; BYTES
0002  20                570      C          DB      020H                            ; LENGTH INDICATOR
                        571      C
                        572      C  ;----- NOTE : DO NOT USE THE SIGNATURE BYTES AS A PRESENCE TEST
                        573      C
                        574      C  ;       PLANAR VIDEO SWITCH SETTINGS
                        575      C
                        576      C  ;       0 0 - UNUSED
                        577      C  ;       0 1 - 40 X 25 COLOR
                        578      C  ;       1 0 - 80 X 25 COLOR
                        579      C  ;       1 1 - 80 X 25 MONOCHROME
                        580      C  ; NOTE : 0 0 MUST BE SET WHEN THIS ADAPTER IS INSTALLED.
                        581      C
                        582      C  ;       VIDEO ADAPTER SWITCH SETTINGS
                        583      C
                        584      C  ;       0 0 0 0 - MONOC PRIMARY, EGA COLOR, 40X25
                        585      C  ;       0 0 0 1 - MONOC PRIMARY, EGA COLOR, 80X25
                        586      C  ;       0 0 1 0 - MONOC PRIMARY, EGA HI RES EMULATE (SAME AS 0001)
                        587      C  ;       0 0 1 1 - MONOC PRIMARY, EGA HI RES ENHANCED
                        588      C  ;       0 1 0 0 - COLOR 40 PRIMARY, EGA MONOCHROME
                        589      C  ;       0 1 0 1 - COLOR 80 PRIMARY, EGA MONOCHROME
                        590      C
                        591      C  ;       0 1 1 0 = MONOC SECONDARY, EGA COLOR, 40X25
                        592      C  ;       0 1 1 1 - MONOC SECONDARY, EGA COLOR, 80X25
                        593      C  ;       1 0 0 0 - MONOC SECONDARY, EGA HI RES EMULATE (SAME AS 0111)
                        594      C  ;       1 0 0 1 - MONOC SECONDARY, EGA HI RES ENHANCED
                        595      C  ;       1 0 1 0 - COLOR 40 SECONDARY, EGA MONOCHROME
                        596      C  ;       1 0 1 1 - COLOR 80 SECONDARY, EGA MONOCHROME
                        597      C
                        598      C  ;       1 1 0 0 - RESERVED
                        599      C  ;       1 1 0 1 - RESERVED
                        600      C  ;       1 1 1 0 - RESERVED
                        601      C  ;       1 1 1 1 - RESERVED
                        602      C
                        603      C  ;----- SETUP ROUTINE FOR THIS MODULE
                        604      C
0003                    605      C  VIDEO_SETUP      PROC    FAR
0003  EB 28              606      C          JMP     SHORT L1
0005  32 34 30 30       607      C          DB      '2400'
0009  36 32 37 37 33 35 608      C          DB      '6277356 (C)COPYRIGHT IBM 1984'
      36 20 28 43 29 43 609      C
      4F 50 59 52 49 47 610      C
      48 54 20 49 42 4D 611      C
      20 31 39 38 34    612      C
0026  39 2F 31 33 2F 38 613      C          DB      '9/13/84'
      34                614      C
                        615      C
                        616      C  ;----- SET UP VIDEO VECTORS
                        617      C
002D                    618      C  L1:
002D  B6 03             619      C          MOV     DH,3
002F  B2 DA             620      C          MOV     DL,INPUT_STATUS
0031  EC                621      C          IN      AL,DX
0032  B2 BA             622      C          MOV     DL,INPUT_STATUS_B
0034  EC                623      C          IN      AL,DX
0035  B2 C0             624      C          MOV     DL,ATTR_WRITE
0037  B0 00             625      C          MOV     AL,0
0039  EE                626      C          OUT     DX,AL
                        627      C
                        628      C          SRLOAD  DS,0
003A  2B D2             629      C+          SUB     DX,DX
003C  8E DA             630      C+          MOV     DS,DX
```

```
003E  FA                        631      C          CLI
003F  C7 06 0040 R 0CD7 R       632      C          MOV     WORD PTR VIDEO,OFFSET COMBO_VIDEO
0045  8C 0E 0042 R              633      C          MOV     WORD PTR VIDEO+2,CS
0049  C7 06 0108 R F065         634      C          MOV     WORD PTR PLANAR_VIDEO,0F065H
004F  C7 06 010A R F000         635      C          MOV     WORD PTR PLANAR_VIDEO+2,0F000H
0055  C7 06 04A8 R 010C R       636      C          MOV     WORD PTR SAVE_PTR,OFFSET SAVE_TBL
005B  8C 0E 04AA R              637      C          MOV     WORD PTR SAVE_PTR+2,CS
005F  C7 06 007C R 0000 E       638      C          MOV     WORD PTR EXT_PTR,OFFSET INT_1F_1
0065  8C 0E 007E R              639      C          MOV     WORD PTR EXT_PTR+2,CS
0069  C7 06 010C R 0000 E       640      C          MOV     WORD PTR GRX_SET,OFFSET CGDDOT
006F  8C 0E 010E R              641      C          MOV     WORD PTR GRX_SET+2,CS
0073  FB                        642      C          STI
                                643      C
                                644      C  ;----- POST FOR COMBO VIDEO CARD
                                645      C
0074  C6 06 0487 R 04           646      C          MOV     INFO,00000100B
0079  E8 009B R                 647      C          CALL    RD_SWS
007C  88 1E 0488 R              648      C          MOV     INFO_3,BL
0080  E8 00CE R                 649      C          CALL    F_BTS
0083  08 06 0488 R              650      C          OR      INFO_3,AL
0087  8A 1E 0488 R              651      C          MOV     BL,INFO_3
008B  E8 00F3 R                 652      C          CALL    MK_ENV
008E  E9 0244 R                 653      C          JMP     POST
0091                            654      C  SKIP:
0091  CB                        655      C          RET
0092                            656      C  VIDEO_SETUP     ENDP
                                657      C
                                658      C
0092                            659      C  POR_1   PROC    NEAR
0092  EE                        660      C          OUT     DX,AL
0093  50                        661      C          PUSH    AX
0094  58                        662      C          POP     AX
0095  EC                        663      C          IN      AL,DX
0096  24 10                     664      C          AND     AL,010H
0098  D0 E8                     665      C          SHR     AL,1
009A  C3                        666      C          RET
009B                            667      C  POR_1 ENDP
                                668      C
                                669      C  ;----- READ THE SWITCH SETTINGS ON THE CARD
                                670      C
009B                            671      C  RD_SWS  PROC    NEAR
                                672      C          ASSUME  DS:ABS0
009B  B6 03                     673      C          MOV     DH,3
009D  B2 C2                     674      C          MOV     DL,MISC_OUTPUT
009F  B0 01                     675      C          MOV     AL,1
00A1  EE                        676      C          OUT     DX,AL
                                677      C
                                678      C  ;----- COULD BE 0,4,8,C
                                679      C
00A2  B0 0D                     680      C          MOV     AL,0DH
00A4  E8 0092 R                 681      C          CALL    POR_1
00A7  D0 E8                     682      C          SHR     AL,1
00A9  D0 E8                     683      C          SHR     AL,1
00AB  D0 E8                     684      C          SHR     AL,1
00AD  8A D8                     685      C          MOV     BL,AL
                                686      C
00AF  B0 09                     687      C          MOV     AL,9
00B1  E8 0092 R                 688      C          CALL    POR_1
00B4  D0 E8                     689      C          SHR     AL,1
00B6  D0 E8                     690      C          SHR     AL,1
00B8  0A D8                     691      C          OR      BL,AL
                                692      C
00BA  B0 05                     693      C          MOV     AL,5
00BC  E8 0092 R                 694      C          CALL    POR_1
00BF  D0 E8                     695      C          SHR     AL,1
00C1  0A D8                     696      C          OR      BL,AL
                                697      C
00C3  B0 01                     698      C          MOV     AL,1
00C5  E8 0092 R                 699      C          CALL    POR_1
00C8  0A D8                     700      C          OR      BL,AL
                                701      C
00CA  80 E3 0F                  702      C          AND     BL,0FH
00CD  C3                        703      C          RET
00CE                            704      C  RD_SWS  ENDP
                                705      C
                                706      C  ;----- OBTAIN THE FEATURE BITS FROM DAUGHTER CARD
                                707      C
00CE                            708      C  F_BTS PROC    NEAR
00CE  B6 03                     709      C          MOV     DH,3
00D0  B2 BA                     710      C          MOV     DL,0BAH
00D2  B0 01                     711      C          MOV     AL,1
00D4  EE                        712      C          OUT     DX,AL
00D5  B2 DA                     713      C          MOV     DL,0DAH
00D7  EE                        714      C          OUT     DX,AL
00D8  B2 C2                     715      C          MOV     DL,IN_STAT_0
00DA  EC                        716      C          IN      AL,DX                   ; READ FEATURE BITS
00DB  24 60                     717      C          AND     AL,060H
00DD  D0 E8                     718      C          SHR     AL,1
00DF  8A D8                     719      C          MOV     BL,AL
00E1  B2 BA                     720      C          MOV     DL,0BAH
00E3  B0 02                     721      C          MOV     AL,2
00E5  EE                        722      C          OUT     DX,AL
00E6  B2 DA                     723      C          MOV     DL,0DAH
00E8  EE                        724      C          OUT     DX,AL
00E9  B2 C2                     725      C          MOV     DL,IN_STAT_0
00EB  EC                        726      C          IN      AL,DX                   ; READ FEATURE BITS
00EC  24 60                     727      C          AND     AL,060H
00EE  D0 E0                     728      C          SHL     AL,1
00F0  0A C3                     729      C          OR      AL,BL
00F2  C3                        730      C          RET
00F3                            731      C  F_BTS ENDP
                                732      C
                                733      C  ;----- ESTABLISH THE VIDEO ENVIRONMENT, KEYED OFF OF THE SWITCHES
                                734      C
00F3                            735      C  MK_ENV  PROC    NEAR
                                736      C          ASSUME  DS:ABS0
00F3  2A FF                     737      C          SUB     BH,BH
00F5  80 E3 0F                  738      C          AND     BL,0FH
00F8  D1 E3                     739      C          SAL     BX,1
00FA  52                        740      C          PUSH    DX
00FB  B6 03                     741      C          MOV     DH,3
00FD  8A E6                     742      C          MOV     AH,DH
00FF  5A                        743      C          POP     DX
0100  80 E4 01                  744      C          AND     AH,1
0103  FE C4                     745      C          INC     AH
0105  F6 D4                     746      C          NOT     AH
0107  2E: FF A7 0128 R          747      C          JMP     WORD PTR CS:[BX + OFFSET T5]
                                748      C
010C                            749      C  SAVE_TBL        LABEL DWORD
010C  0717 R                    750      C          DW      OFFSET VIDEO_PARMS      ; PARMS
010E  C000                      751      C          DW      0C000H                  ; PARMS
0110  0000                      752      C          DW      0                       ; PAL SAVE AREA
0112  0000                      753      C          DW      0                       ; PAL SAVE AREA
0114  0000                      754      C          DW      0                       ; ALPHA TABLES
0116  0000                      755      C          DW      0                       ; ALPHA TABLES
0118  0000                      756      C          DW      0                       ; GRAPHICS TABLES
```

```
011A  0000                    757     C             DW      0                               ; GRAPHICS TABLES
                              758     C
011C  0000                    759     C             DW      0
011E  0000                    760     C             DW      0
0120  0000                    761     C             DW      0
0122  0000                    762     C             DW      0
0124  0000                    763     C             DW      0
0126  0000                    764     C             DW      0
                              765     C
0128                          766     C  T5         LABEL   WORD
0128  0173 R                 767     C             DW      OFFSET PST_0
012A  017E R                  768     C             DW      OFFSET PST_1
012C  017E R                  769     C             DW      OFFSET PST_2
012E  0189 R                  770     C             DW      OFFSET PST_3
0130  0194 R                  771     C             DW      OFFSET PST_4
0132  01A8 R                  772     C             DW      OFFSET PST_5
0134  01BC R                  773     C             DW      OFFSET PST_6
0136  01C7 R                  774     C             DW      OFFSET PST_7
                              775     C
0138  01C7 R                  776     C             DW      OFFSET PST_8
013A  01D2 R                  777     C             DW      OFFSET PST_9
013C  01DD R                  778     C             DW      OFFSET PST_A
013E  01F1 R                  779     C             DW      OFFSET PST_B
0140  0204 R                  780     C             DW      OFFSET PST_OUT
0142  0204 R                  781     C             DW      OFFSET PST_OUT
0144  0204 R                  782     C             DW      OFFSET PST_OUT
0146  0204 R                  783     C             DW      OFFSET PST_OUT
                              784     C
0148                          785     C  ENV_X      PROC    NEAR                            ; SET 40X25 COLOR ALPHA
0148  80 26 0410 R CF         786     C             AND     EQUIP_LOW,0CFH
014D  80 0E 0410 R 10         787     C             OR      EQUIP_LOW,010H
0152  B8 0001                 788     C             MOV     AX,1H
0155  CD 10                   789     C             INT     10H
0157  C3                     790     C             RET
0158                          791     C  ENV_X      ENDP
                              792     C
0158                          793     C  ENV_0      PROC    NEAR                            ; SET 80X25 COLOR ALPHA
0158  80 26 0410 R CF         794     C             AND     EQUIP_LOW,0CFH
015D  80 0E 0410 R 20         795     C             OR      EQUIP_LOW,020H
0162  B8 0003                 796     C             MOV     AX,03H
0165  CD 10                   797     C             INT     10H
0167  C3                     798     C             RET
0168                          799     C  ENV_0      ENDP
                              800     C
0168                          801     C  ENV_3      PROC    NEAR                            ; SET MONOCHROME ALPHA
0168  80 0E 0410 R 30         802     C             OR      EQUIP_LOW,030H
016D  B8 0007                 803     C             MOV     AX,07H
0170  CD 10                   804     C             INT     10H
0172  C3                     805     C             RET
0173                          806     C  ENV_3      ENDP
                              807     C
                              808     C
0173                          809     C  PST_0:
0173  20 26 0487 R            810     C             AND     INFO,AH
0177  E8 0148 R               811     C             CALL    ENV_X
017A  E8 0168 R               812     C             CALL    ENV_3
017D  C3                      813     C             RET
017E                          814     C  PST_1:
017E                          815     C  PST_2:
017E  20 26 0487 R            816     C             AND     INFO,AH
0182  E8 0158 R               817     C             CALL    ENV_0
0185  E8 0168 R               818     C             CALL    ENV_3
0188  C3                      819     C             RET
0189                          820     C  PST_3:
0189  20 26 0487 R            821     C             AND     INFO,AH
018D  E8 0158 R               822     C             CALL    ENV_0
0190  E8 0168 R               823     C             CALL    ENV_3
0193  C3                      824     C             RET
0194                          825     C  PST_4:
0194  B6 03                   826     C             MOV     DH,3
0196  B2 C2                   827     C             MOV     DL,MISC_OUTPUT
0198  B0 00                   828     C             MOV     AL,0
019A  EE                      829     C             OUT     DX,AL
019B  F6 D4                   830     C             NOT     AH
019D  08 26 0487 R            831     C             OR      INFO,AH
01A1  E8 0168 R               832     C             CALL    ENV_3
01A4  E8 0148 R               833     C             CALL    ENV_X
01A7  C3                      834     C             RET
01A8                          835     C  PST_5:
01A8  B6 03                   836     C             MOV     DH,3
01AA  B2 C2                   837     C             MOV     DL,MISC_OUTPUT
01AC  B0 00                   838     C             MOV     AL,0
01AE  EE                      839     C             OUT     DX,AL
01AF  F6 D4                   840     C             NOT     AH
01B1  08 26 0487 R            841     C             OR      INFO,AH
01B5  E8 0168 R               842     C             CALL    ENV_3
01B8  E8 0158 R               843     C             CALL    ENV_0
01BB  C3                      844     C             RET
01BC                          845     C  PST_6:
01BC  20 26 0487 R            846     C             AND     INFO,AH
01C0  E8 0168 R               847     C             CALL    ENV_3
01C3  E8 0148 R               848     C             CALL    ENV_X
01C6  C3                      849     C             RET
01C7                          850     C  PST_7:
01C7                          851     C  PST_8:
01C7  20 26 0487 R            852     C             AND     INFO,AH
01CB  E8 0168 R               853     C             CALL    ENV_3
01CE  E8 0158 R               854     C             CALL    ENV_0
01D1  C3                      855     C             RET
01D2                          856     C  PST_9:
01D2  20 26 0487 R            857     C             AND     INFO,AH
01D6  E8 0168 R               858     C             CALL    ENV_3
01D9  E8 0158 R               859     C             CALL    ENV_0
01DC  C3                      860     C             RET
01DD                          861     C  PST_A:
01DD  B6 03                   862     C             MOV     DH,3
01DF  B2 C2                   863     C             MOV     DL,MISC_OUTPUT
01E1  B0 00                   864     C             MOV     AL,0
01E3  EE                      865     C             OUT     DX,AL
01E4  F6 D4                   866     C             NOT     AH
01E6  08 26 0487 R            867     C             OR      INFO,AH
01EA  E8 0148 R               868     C             CALL    ENV_X
01ED  E8 0168 R               869     C             CALL    ENV_3
01F0  C3                      870     C             RET
01F1                          871     C  PST_B:
01F1  B6 03                   872     C             MOV     DH,3
01F3  B2 C2                   873     C             MOV     DL,MISC_OUTPUT
01F5  B0 00                   874     C             MOV     AL,0
01F7  EE                      875     C             OUT     DX,AL
01F8  F6 D4                   876     C             NOT     AH
01FA  08 26 0487 R            877     C             OR      INFO,AH
01FE  E8 0158 R               878     C             CALL    ENV_0
0201  E8 0168 R               879     C             CALL    ENV_3
0204                          880     C  PST_OUT:
0204  C3                      881     C             RET
0205                          882     C  MK_ENV     ENDP
```

```
                                883     C
                                884     C ;--------------------------------------------------------------------------------
                                885     C ; THIS ROUTINE TESTS THE CRT CARD INTERNAL DATA BUS AND IN A LIMITED    :
                                886     C ; WAY TESTS THE CRTC VIDEO CHIP BY WRITING/READING FROM CURSOR REGISTER :
                                887     C ; CARRY IS SET IF AN ERROR IS FOUND                                      :
                                888     C ;                                                                        :
                                889     C ; REGISTERS BX,SI,ES,DS ARE PRESERVED.                                   :
                                890     C ; REGISTERS AX,CX,DX ARE MODIFYED.                                       :
                                891     C ;--------------------------------------------------------------------------------
0205                            892     C CD_PRESENCE_TST PROC    NEAR
0205  53                        893     C         PUSH    BX                      ; SAVE BX
0206  BB 007F                  894     C         MOV     BX,07FH                 ; INITIAL WORD PATTERN BYTE
0209  8B FB                    895     C         MOV     DI,BX
020B  50                        896     C         PUSH    AX                      ; SAVE PORT ADDRESS
020C  E8 022C R                 897     C         CALL    RD_CURSOR               ;
020F  8B F0                     898     C         MOV     SI,AX                   ; SAVE ORIGINAL VALUE
0211  58                        899     C         POP     AX                      ; RECOVER PORT ADDRESS
0212  50                        900     C         PUSH    AX                      ; SAVE PORT ADDRESS
0213  E8 0236 R                 901     C         CALL    WR_CURSOR               ; WRITE CURSOR
0216  58                        902     C         POP     AX                      ; RECOVER PORT ADDRESS
0217  50                        903     C         PUSH    AX                      ; SAVE PORT ADDRESS
0218  E8 022C R                 904     C         CALL    RD_CURSOR               ; READ IT BACK
021B  3B C7                     905     C         CMP     AX,DI                   ; SAME?
021D  58                        906     C         POP     AX
021E  75 03                     907     C         JNZ     NOT_PRESENT             ; EXIT IF NOT EQUAL
0220  EB 05 90                  908     C         JMP     TST_EX
0223                            909     C NOT_PRESENT:
0223  33 C0                     910     C         XOR     AX,AX                   ; SET NOT PRESENT
0225  5B                        911     C         POP     BX
0226  C3                        912     C         RET
0227                            913     C TST_EX:
0227  B8 0001                  914     C         MOV     AX,1                    ; SET PRESENT ON EXIT
022A  5B                        915     C         POP     BX                      ; RESTORE BX
022B  C3                        916     C         RET
022C                            917     C CD_PRESENCE_TST ENDP
                                918     C
                                919     C ;--------------------------------------------------------------------------------
                                920     C ; MODULE NAME   RD_CURSOR                                                :
                                921     C ;  READ CURSOR POSITION [ADDRESS] (FROM CRTC) TO  AX                     :
                                922     C ;                                                                        :
                                923     C ; REGISTER AX IS MODIFIED.                                               :
                                924     C ;--------------------------------------------------------------------------------
022C                            925     C RD_CURSOR       PROC NEAR
022C  52                        926     C         PUSH    DX                      ; SAVE REGS USED
022D  8B D0                     927     C         MOV     DX,AX
022F  B0 0E                     928     C         MOV     AL,C_CRSR_LOC_HGH
0231  EE                        929     C         OUT     DX,AL
0232  42                        930     C         INC     DX
0233  EC                        931     C         IN      AL,DX
                                932     C                                         ; RETURN WITH CURSOR POS IN AX
                                933     C                                         ; RESTORE REGS USED
0234  5A                        934     C         POP     DX
0235  C3                        935     C         RET
0236                            936     C RD_CURSOR       ENDP
                                937     C
                                938     C ;--------------------------------------------------------------------------------
                                939     C ; MODULE NAME   WR_CURSOR                                                :
                                940     C ;  WRITE CURSOR POSITION [ADDRESS] (TO CRTC) WITH CONTENTS OF AX         :
                                941     C ;                                                                        :
                                942     C ; ALL REGISTERS PRESERVED                                                :
                                943     C ;--------------------------------------------------------------------------------
0236                            944     C WR_CURSOR       PROC NEAR
                                945     C                                         ; SAVE REGS USED
0236  50                        946     C         PUSH    AX
0237  52                        947     C         PUSH    DX
0238  8B D0                     948     C         MOV     DX,AX
023A  B4 0E                     949     C         MOV     AH,C_CRSR_LOC_HGH       ; CURSOR LOCATION HIGH INDEX
023C  B0 7F                     950     C         MOV     AL,07FH                 ; TEST VALUE
023E  E8 0D15 R                 951     C         CALL    OUT_DX
                                952     C                                         ; RETURN WITH CURSOR POS IN AX
                                953     C                                         ; RESTORE REGS USED
0241  5A                        954     C         POP     DX
0242  58                        955     C         POP     AX
0243  C3                        956     C         RET
0244                            957     C WR_CURSOR       ENDP
                                958     C
0244                            959     C POST:
                                960     C ;-------------------------------------------------------
                                961     C ;       INITIALIZE AND START CRT CONTROLLER (6845)      :
                                962     C ;       ON COLOR GRAPHICS AND MONOCHROME CARDS          :
                                963     C ;       TEST VIDEO READ/WRITE STORAGE.                  :
                                964     C ; DESCRIPTION                                           :
                                965     C ;       RESET THE VIDEO ENABLE SIGNAL.                  :
                                966     C ;       SELECT ALPHANUMERIC MODE, 40 * 25, B & W.       :
                                967     C ;       READ/WRITE DATA PATTERNS TO STG. CHECK STG      :
                                968     C ;       ADDRESSABILITY.                                 :
                                969     C ;-------------------------------------------------------
                                970     C         ASSUME DS:ABS0,ES:ABS0
0244  E8 0CFE R                 971     C         CALL    DDS
0247  F6 06 0487 R 02           972     C         TEST    INFO,2
024C  75 12                     973     C         JNZ     COLOR_PRESENCE_TST
024E  B8 03B4                   974     C         MOV     AX,03B4H
0251  E8 0205 R                 975     C         CALL    CD_PRESENCE_TST
0254  3D 0001                  976     C         CMP     AX,1
0257  74 03                     977     C         JE      CONT1
0259  E9 0317 R                 978     C         JMP     POD14
025C                            979     C CONT1:
025C  B4 30                     980     C         MOV     AH,30H                  ; MONOCHROME CARD INSTALLED
025E  EB 10                     981     C         JMP     SHORT   OVER
0260                            982     C COLOR_PRESENCE_TST:
0260  B8 03D4                   983     C         MOV     AX,03D4H
0263  E8 0205 R                 984     C         CALL    CD_PRESENCE_TST
0266  3D 0001                  985     C         CMP     AX,1
0269  74 03                     986     C         JE      CONT2
026B  E9 0317 R                 987     C         JMP     POD14
026E                            988     C CONT2:
026E  B4 20                     989     C         MOV     AH,20H                  ; COLOR GRAPHICS CARD INSTALLED
0270                            990     C OVER:
0270  50                        991     C         PUSH    AX                      ; RESAVE VALUE
0271  BB B000                  992     C         MOV     BX,0B000H               ; BEG VIDEO RAM ADDR B/W CD
0274  BA 03B8                   993     C         MOV     DX,3B8H                 ; MODE CONTROL B/W
0277  B9 1000                  994     C         MOV     CX,4096                 ; RAM BYTE CNT FOR B/W CD
027A  B0 01                     995     C         MOV     AL,1                    ; SET MODE FOR BW CARD
027C  80 FC 30                  996     C         CMP     AH,30H                  ; B/W VIDEO CARD ATTACHED?
027F  74 08                     997     C         JE      E9                      ; YES - GO TEST VIDEO STG
0281  B7 B8                     998     C         MOV     BH,0B8H                 ; BEG VIDEO RAM ADDR COLOR CD
0283  B2 D8                     999     C         MOV     DL,0D8H                 ; MODE CONTROL COLOR
0285  B5 40                    1000     C         MOV     CH,40H                  ; RAM BYTE CNT FOR COLOR CD
0287  FE C8                    1001     C         DEC     AL                      ; SET MODE TO 0 FOR COLOR CD
0289                           1002     C E9:                                     ; TEST_VIDEO_STG:
0289  EE                       1003     C         OUT     DX,AL                   ; DISABLE VIDEO FOR COLOR CD
                               1004     C
028A  8B 2E 0472 R             1005     C         MOV     BP,DS:RESET_FLAG        ; POD INITIALIZED BY KBD RESET
                               1006     C
028E  81 FD 1234               1007     C         CMP     BP,1234H                ; POD INITIATED BY KBD RESET?
0292  8E C3                    1008     C         MOV     ES,BX                   ; POINT ES TO VIDEO RAM STG
```

```
0294  74 07              1009     C          JE      E10                     ; YES - SKIP VIDEO RAM TEST
0296  8E DB              1010     C          MOV     DS,BX                   ; POINT DS TO VIDEO RAM STG
                         1011     C          ASSUME  DS:NOTHING,ES:NOTHING
0298  E8 02DF R          1012     C          CALL    STGTST_CNT              ; GO TEST VIDEO R/W STG
029B  75 2E              1013     C          JNE     E17                     ; R/W STG FAILURE - BEEP SPK
                         1014     C  ;--------------------------------------------------------------
                         1015     C  ;       SETUP VIDEO DATA ON SCREEN FOR VIDEO LINE TEST.        :
                         1016     C  ; DESCRIPTION                                                  :
                         1017     C  ;       ENABLE VIDEO SIGNAL AND SET MODE.                      :
                         1018     C  ;       DISPLAY A HORIZONTAL BAR ON SCREEN.                    :
                         1019     C  ;--------------------------------------------------------------
029D                     1020     C  E10:
029D  58                 1021     C          POP     AX                      ; GET VIDEO SENSE SWS (AH)
029E  50                 1022     C          PUSH    AX                      ; SAVE IT
029F  B8 7020            1023     C          MOV     AX,7020H                ; WRT BLANKS IN REVERSE VIDEO
02A2  2B FF              1024     C          SUB     DI,DI                   ; SETUP STARTING LOC
02A4  B9 0028            1025     C          MOV     CX,40                   ; NO. OF BLANKS TO DISPLAY
02A7  F3/ AB             1026     C          REP     STOSW                   ; WRITE VIDEO STORAGE
                         1027     C  ;-----------------------------------------------------------
                         1028     C  ;       CRT INTERFACE LINES TEST                          :
                         1029     C  ; DESCRIPTION                                             :
                         1030     C  ;       SENSE ON/OFF TRANSITION OF THE VIDEO ENABLE       :
                         1031     C  ;       AND HORIZONTAL SYNC LINES.                        :
                         1032     C  ;-----------------------------------------------------------
02A9  58                 1033     C          POP     AX                      ; GET VIDEO SENSE SW INFO
02AA  50                 1034     C          PUSH    AX                      ; SAVE IT
02AB  80 FC 30           1035     C          CMP     AH,30H                  ; B/W CARD ATTACHED?
02AE  BA 03BA            1036     C          MOV     DX,03BAH                ; SETUP ADDR OF BW STATUS PORT
02B1  74 02              1037     C          JE      E11                     ; YES - GO TEST LINES
02B3  B2 DA              1038     C          MOV     DL,0DAH                 ; COLOR CARD IS ATTACHED
02B5                     1039     C  E11:                                    ; LINE_TST:
02B5  B4 08              1040     C          MOV     AH,8
02B7                     1041     C  E12:                                    ; OFLOOP_CNT:
02B7  2B C9              1042     C          SUB     CX,CX
02B9                     1043     C  E13:
02B9  EC                 1044     C          IN      AL,DX                   ; READ CRT STATUS PORT
02BA  22 C4              1045     C          AND     AL,AH                   ; CHECK VIDEO/HORZ LINE
02BC  75 04              1046     C          JNZ     E14                     ; ITS ON - CHECK IF IT GOES OFF
02BE  E2 F9              1047     C          LOOP    E13                     ; LOOP TILL ON OR TIMEOUT
02C0  EB 09              1048     C          JMP     SHORT E17               ; GO PRINT ERROR MSG
02C2                     1049     C  E14:
02C2  2B C9              1050     C          SUB     CX,CX
02C4                     1051     C  E15:
02C4  EC                 1052     C          IN      AL,DX                   ; READ CRT STATUS PORT
02C5  22 C4              1053     C          AND     AL,AH                   ; CHECK VIDEO/HORZ LINE
02C7  74 0A              1054     C          JZ      E16                     ; ITS ON - CHECK NEXT LINE
02C9  E2 F9              1055     C          LOOP    E15                     ; LOOP IF OFF TILL IT GOES ON
02CB                     1056     C  E17:                                    ; CRT_ERR
02CB  BA 0102            1057     C          MOV     DX,102H
02CE  E8 06C8 R          1058     C          CALL    ERR_BEEP                ; GO BEEP SPEAKER
02D1  EB 06              1059     C          JMP     SHORT E18
02D3                     1060     C  E16:                                    ; NXT_LINE
02D3  B1 03              1061     C          MOV     CL,3                    ; GET NEXT BIT TO CHECK
02D5  D2 EC              1062     C          SHR     AH,CL
02D7  75 DE              1063     C          JNZ     E12                     ; GO CHECK HORIZONTAL LINE
02D9                     1064     C  E18:                                    ; DISPLAY_CURSOR:
02D9  58                 1065     C          POP     AX                      ; GET VIDEO SENSE SWS (AH)
02DA  EB 3B              1066     C          JMP     SHORT  POD14
                         1067     C
                         1068     C  ;-------------------------------------------------------------------------
                         1069     C  ;       THIS SUBROUTINE PERFORMS A READ/WRITE STORAGE TEST ON          :
                         1070     C  ;       A 16K BLOCK OF STORAGE.                                        :
                         1071     C  ; ENTRY REQUIREMENTS:                                                  :
                         1072     C  ;       ES = ADDRESS OF STORAGE SEGMENT BEING TESTED                   :
                         1073     C  ;       DS = ADDRESS OF STORAGE SEGMENT BEING TESTED                   :
                         1074     C  ;       WHEN ENTERING AT STGTST_CNT, CX MUST BE LOADED WITH            :
                         1075     C  ;       THE BYTE COUNT.                                                :
                         1076     C  ; EXIT PARAMETERS:                                                     :
                         1077     C  ;       ZERO FLAG = 0 IF STORAGE ERROR (DATA COMPARE OR PARITY CHECK.  :
                         1078     C  ;             AL = 0 DENOTES A PARITY CHECK. ELSE AL=XOR'ED BIT        :
                         1079     C  ;                    PATTERN OF THE EXPECTED DATA PATTERN VS THE      :
                         1080     C  ;                    ACTUAL DATA READ.                                :
                         1081     C  ;       AX,BX,CX,DX,DI, AND SI ARE ALL DESTROYED.                      :
                         1082     C  ;-------------------------------------------------------------------------
02DC                     1083     C  STGTST  PROC    NEAR
02DC  B9 4000            1084     C          MOV     CX,4000H                ; SETUP CNT TO TEST A 16K BLK
02DF                     1085     C  STGTST_CNT:
02DF  FC                 1086     C          CLD                             ; SET DIR FLAG TO INCREMENT
02E0  8B D9              1087     C          MOV     BX,CX                   ; SAVE CNT (4K FOR VIDEO OR 16K)
02E2  B8 AAAA            1088     C          MOV     AX,0AAAAH               ; GET DATA PATTERN TO WRITE
02E5  BA FF55            1089     C          MOV     DX,0FF55H               ; SETUP OTHER DATA PATTERNS TO USE
02E8  2B FF              1090     C          SUB     DI,DI                   ; DI = OFFSET 0 RELATIVE TO ES REG
02EA  F3/ AA             1091     C          REP     STOSB                   ; WRITE STORAGE LOCATIONS
02EC                     1092     C  C3:                                     ;  STG01
02EC  4F                 1093     C          DEC     DI                      ; POINT TO LAST BYTE JUST WRITTEN
02ED  FD                 1094     C          STD                             ; SET DIR FLAG TO GO BACKWARDS
02EE                     1095     C  C4:
02EE  8B F7              1096     C          MOV     SI,DI
02F0  8B CB              1097     C          MOV     CX,BX                   ; SETUP BYTE CNT
02F2                     1098     C  C5:                                     ; INNER TEST LOOP
02F2  AC                 1099     C          LODSB                           ; READ OLD TEST BYTE [SI]+
02F3  32 C4              1100     C          XOR     AL,AH                   ; DATA READ AS EXPECTED ?
02F5  75 1E              1101     C          JNE     C7                      ;  NO - GO TO ERROR ROUTINE
02F7  8A C2              1102     C          MOV     AL,DL                   ; GET NEXT DATA PATTERN TO WRITE
02F9  AA                 1103     C          STOSB                           ; WRITE INTO LOCATION JUST READ
02FA  E2 F6              1104     C          LOOP    C5                      ; DECREMENT COUNT AND LOOP CX
                         1105     C
02FC  22 E4              1106     C          AND     AH,AH                   ; ENDING 0 PATTERN WRITTEN TO STG?
02FE  74 13              1107     C          JZ      C6X                     ; YES - RETURN TO CALLER WITH AL=0
0300  8A E0              1108     C          MOV     AH,AL                   ; SETUP NEW VALUE FOR COMPARE
0302  86 F2              1109     C          XCHG    DH,DL                   ; MOVE NEXT DATA PATTERN TO DL
0304  22 E4              1110     C          AND     AH,AH                   ; READING ZERO PATTERN THIS PASS ?
0306  75 04              1111     C          JNZ     C6                      ; CONTINUE TEST SEQUENCE TILL 0
0308  8A D4              1112     C          MOV     DL,AH                   ;  ELSE SET 0 FOR END READ PATTERN
030A  EB E0              1113     C          JMP     C3                      ;  AND MAKE FINAL BACKWARDS PASS
030C                     1114     C  C6:
030C  FC                 1115     C          CLD                             ; SET DIR FLAG TO GO FORWARD
030D  47                 1116     C          INC     DI                      ; SET POINTER TO BEG LOCATION
030E  74 DE              1117     C          JZ      C4                      ; READ/WRITE FORWARD IN STG
0310  4F                 1118     C          DEC     DI                      ; ADJUST POINTER
0311  EB D9              1119     C          JMP     C3                      ; READ/WRITE BACKWARD IN STG
0313                     1120     C  C6X:
0313  B0 00              1121     C          MOV     AL,000H                 ; AL=0 DATA COMPARE OK
0315                     1122     C  C7:
0315  FC                 1123     C          CLD                             ; SET DIRECTION FLAG BACK TO INC
0316  C3                 1124     C          RET
0317                     1125     C  STGTST  ENDP
                         1126     C
                         1127     C  ;-----------------------------------------------------------
                         1128     C  ;              EGA CRT ATTACHMENT TEST                     :
                         1129     C  ;                                                          :
                         1130     C  ; 1. INIT CRT TO 40X25 - BW ****SET TO MODE****          :
                         1131     C  ; 2. CHECK FOR VERTICAL AND VIDEO ENABLES, AND CHECK     :
                         1132     C  ;    TIMING OF SAME                                      :
                         1133     C  ; 3. CHECK VERTICAL INTERRUPT                            :
                         1134     C  ; 4. CHECK RED, BLUE, GREEN, AND INTENSIFY DOTS          :
```

```
                        1135     C  ; 5. INIT TO 40X25 - COLOR/MONO ****SET TO MODE****     :
                        1136     C  ;-------------------------------------------------------
                        1137     C
                        1138     C  ;----- NOMINAL TIME IS B286H FOR 60 HZ.
                        1139     C  ;----- NOMINAL TIME IS A2FEH FOR 50 HZ.
                        1140     C
= A0AC                  1141     C  MAX_VERT_COLOR  EQU     0A0ACH                ; MAX TIME FOR VERT/VERT
                        1142     C                                                ;  (NOMINAL + 109)
= C460                  1143     C  MIN_VERT_COLOR  EQU     0C460H                ; MIN TIME FOR VERT/VERT
                        1144     C                                                ;  (NOMINAL - 104)
= 00C8                  1145     C  CENAB_PER_FRAME EQU     200                   ; NUM OF ENABLES PER FRAME
= 8D99                  1146     C  MAX_VERT_MONO   EQU     08D99H                ; MAX TIME FOR VERT/VERT
                        1147     C                                                ;  (NOMINAL + 104)
= B862                  1148     C  MIN_VERT_MONO   EQU     0B862H                ; MIN TIME FOR VERT/VERT
                        1149     C                                                ;  (NOMINAL - 104)
= 015E                  1150     C  EENAB_PER_FRAME EQU     350                   ; ENHANCED ENABLES PER FRAME
= 015E                  1151     C  MENAB_PER_FRAME EQU     350                   ; NUM OF ENABLES PER FRAME
                        1152     C
= 0043                  1153     C  TIM_CTL         EQU     043H                  ; 8253 TIMER CONTROL PORT
= 0040                  1154     C  TIMER0          EQU     040H                  ; 8253 TIMER/CNTER 0 PORT
                        1155     C
0317                    1156     C  POD14   PROC    NEAR
0317  83 EC 0A         1157     C          SUB     SP,0AH                        ; RESERVE 5 WORDS ON STACK
031A  8B EC             1158     C          MOV     BP,SP                         ; INIT SCRATCH PAD POINTER
                        1159     C
                        1160     C          ASSUME  DS:ABS0,ES:ABS0
031C  E8 0CFE R         1161     C          CALL    DDS
031F  B0 30             1162     C          MOV     AL,00110000B                  ; SET TIMER 0 TO MODE 0
                        1163     C
0321  E6 43             1164     C          OUT     TIM_CTL,AL
0323  B0 00             1165     C          MOV     AL,00H
0325  E6 40             1166     C          OUT     TIMER0,AL                     ; SEND FIRST BYTE TO TIMER
0327  F6 06 0487 R 02   1167     C          TEST    INFO,2
032C  74 1F             1168     C          JZ      COLOR_EGA_V
032E  E8 0168 R         1169     C          CALL    ENV_3                         ; SET UP IN MONOCHROME
0331  C7 46 02 015E     1170     C          MOV     WORD PTR[BP][2],MENAB_PER_FRAME ; NUM.OF FRAMES FOR MONO
0336  C7 46 04 8D99     1171     C          MOV     WORD PTR[BP][4],MAX_VERT_MONO ; MAX TIME FOR VERT/VERT
033B  C7 46 06 B862     1172     C          MOV     WORD PTR[BP][6],MIN_VERT_MONO ; MIN TIME FOR VERT/VERT
0340  B2 B4             1173     C          MOV     DL,CRTC_ADDR_B                ; MONO CRTC REG
0342  B4 01             1174     C          MOV     AH,C_HRZ_DSP                  ; HORIZ. TOTAL DIPLAY
0344  B0 27             1175     C          MOV     AL,27H                        ;  TO 40 COL
0346  E8 0D15 R         1176     C          CALL    OUT_DX                        ;
0349  B2 BA             1177     C          MOV     DL,INPUT_STATUS_B             ; 3BA
034B  EB 2A             1178     C          JMP     SHORT COMMON
034D                    1179     C  COLOR_EGA_V:
034D  E8 0148 R         1180     C          CALL    ENV_X                         ; SET UP IN 40X25 COLOR
0350  E8 0E9A R         1181     C          CALL    BRST_DET                      ; ENHANCED MODE
0353  73 11             1182     C          JNC     COLOR_V                       ; NO,40X25
0355  B2 D4             1183     C          MOV     DL,CRTC_ADDR                  ; BRST MODE ONLY
0357  B4 01             1184     C          MOV     AH,1                          ; HRZ DSP END
0359  B0 14             1185     C          MOV     AL,20                         ; MODIFY FOR TEST ONLY
035B  E8 0D15 R         1186     C          CALL    OUT_DX
035E  C7 46 02 015E     1187     C          MOV     WORD PTR[BP][2],EENAB_PER_FRAME ; NUM.OF FRAMES FOR COLOR
0363  EB 06 90          1188     C          JMP     BRST_COLOR_V
0366                    1189     C  COLOR_V:
                        1190     C
0366  C7 46 02 00C8     1191     C          MOV     WORD PTR[BP][2],CENAB_PER_FRAME ; NUM.OF FRAMES FOR COLOR
036B                    1192     C  BRST_COLOR_V:
036B  C7 46 04 A0AC     1193     C          MOV     WORD PTR[BP][4],MAX_VERT_COLOR  ; MAX TIME FOR VERT/VERT
0370  C7 46 06 C460     1194     C          MOV     WORD PTR[BP][6],MIN_VERT_COLOR  ; MIN TIME FOR VERT/VERT
0375  B2 DA             1195     C          MOV     DL,INPUT_STATUS               ; SET ADDRESSING TO VIDEO
                        1196     C                                                ;  ATTR STATUS
0377                    1197     C  COMMON:
0377  B8 0500           1198     C          MOV     AX,0500H                      ; SET TO VIDEO PAGE 0
037A  CD 10             1199     C          INT     10H
037C  2B C9             1200     C          SUB     CX,CX
                        1201     C
                        1202     C  ;----- LOOK FOR VERTICAL
                        1203     C
037E                    1204     C  POD14_1:
037E  EC                1205     C          IN      AL,DX                         ; GET STATUS
037F  A8 08             1206     C          TEST    AL,00001000B                  ; VERTICAL THERE YET?
0381  75 07             1207     C          JNE     POD14_2                       ; CONTINUE IF IT IS
0383  E2 F9             1208     C          LOOP    POD14_1                       ; KEEP LOOKING TILL COUNT
0385  B3 00             1209     C          MOV     BL,00                         ; EXHAUSTED
0387  E9 0448 R         1210     C          JMP     POD14_ERR                     ; NO VERTICAL
                        1211     C
                        1212     C  ;----- GOT VERTICAL - START TIMER
                        1213     C
038A                    1214     C  POD14_2:
038A  B0 00             1215     C          MOV     AL,0
038C  E6 40             1216     C          OUT     TIMER0,AL                     ; SEND 2ND BYTE TO TIMER TO
                        1217     C                                                ; START IT
038E  2B DB             1218     C          SUB     BX,BX                         ; ENIT. ENABLE COUNTER
                        1219     C  ;----- WAIT FOR VERTICAL TO GO AWAY
0390  33 C9             1220     C          XOR     CX,CX
0392                    1221     C  POD14_25:
0392  EC                1222     C          IN      AL,DX                         ; GET STATUS
0393  A8 08             1223     C          TEST    AL,00001000B                  ; VERTICAL STILL THERE
0395  74 07             1224     C          JZ      POD14_3                       ; CONTINUE IF ITS GONE
0397  E2 F9             1225     C          LOOP    POD14_25                      ; KEEP LOOKING TILL COUNT
0399  B3 01             1226     C          MOV     BL,01H                        ; EXHAUSTED
039B  E9 0448 R         1227     C          JMP     POD14_ERR                     ; VERTICAL STUCK ON
                        1228     C
                        1229     C  ;----- NOW START LOOKING FOR ENABLE TRANSITIONS
                        1230     C
039E                    1231     C  POD14_3:
039E  2B C9             1232     C          SUB     CX,CX
03A0                    1233     C  POD14_4:
03A0  EC                1234     C          IN      AL,DX                         ; GET STATUS
03A1  A8 01             1235     C          TEST    AL,00000001B                  ; ENABLE ON YET?
03A3  74 15             1236     C          JE      POD14_5                       ; GO ON IF IT IS
03A5  A8 08             1237     C          TEST    AL,00001000B                  ; VERTICAL ON AGAIN?
03A7  75 23             1238     C          JNE     POD14_75                      ; CONTINUE IF IT IS
03A9  E2 F5             1239     C          LOOP    POD14_4                       ; KEEP LOOKING IF NOT
03AB  B3 02             1240     C          MOV     BL,02H
03AD  E9 0448 R         1241     C          JMP     POD14_ERR                     ; ENABLE STUCK OFF
03B0                    1242     C  POD14_4A:
03B0  B3 03             1243     C          MOV     BL,03H
03B2  E9 0448 R         1244     C          JMP     POD14_ERR                     ; VERTICAL STUCK ON
03B5                    1245     C  POD14_48:
03B5  B3 04             1246     C          MOV     BL,04H
03B7  E9 0448 R         1247     C          JMP     POD14_ERR                     ; ENABLE STUCK ON
                        1248     C
                        1249     C  ;----- MAKE SURE VERTICAL WENT OFF WITH ENABLE GOING ON
                        1250     C
03BA                    1251     C  POD14_5:
03BA  A8 08             1252     C          TEST    AL,00001000B                  ; VERTICAL OFF?
03BC  75 F2             1253     C          JNZ     POD14_4A                      ; GO ON IF IT IS
                        1254     C  ;----- NOW WAIT FOR ENABLE TO GO OFF           ; (ERROR IF NOT)
03BE                    1255     C  POD14_6:
03BE  EC                1256     C          IN      AL,DX                         ; GET STATUS
03BF  A8 01             1257     C          TEST    AL,00000001B                  ; ENABLE OFF YET?
03C1  E1 FB             1258     C          LOOPE   POD14_6                       ; KEEP LOOKING IF NOT
03C3  E3 F0             1259     C          JCXZ    POD14_48                      ; YET LOW
                        1260     C  ;----- ENABLE HAS TOGGLED, BUMP COUNTER AND TEST FOR NEXT VERTICAL
```

```
03C5                    1261     C  POD14_7:
03C5  43                1262     C          INC     BX                              ; BUMP ENABLE COUNTER
03C6  74 04             1263     C          JZ      POD14_75                        ; IF COUNTER WRAPS,
                        1264     C                                                  ;  SOMETHING IS WRONG
03C8  A8 08             1265     C          TEST    AL,00001000B                    ; DID ENABLE GO LOW
                        1266     C                                                  ;  BECAUSE OF VERTICAL
03CA  74 D2             1267     C          JZ      POD14_3                         ; IF NOT, LOOK FOR ANOTHER
                        1268     C                                                  ;  ENABLE TOGGLE
                        1269     C  ;----- HAVE HAD COMPLETE VERTICAL-VERTICAL CYCLE, NOW TEST RESULTS
03CC                    1270     C  POD14_75:
03CC  B0 00             1271     C          MOV     AL,00                           ; LATCH TIMER0
03CE  E6 43             1272     C          OUT     TIM_CTL,AL
03D0  3B 5E 02          1273     C          CMP     BX,WORD PTR[BP][2]              ; NUMBER OF ENABLES BETWEEN
                        1274     C                                                  ;  VERTICALS O.K.?
03D3  74 04             1275     C          JE      POD14_8
03D5  B3 05             1276     C          MOV     BL,05H
03D7  EB 6F             1277     C          JMP     SHORT POD14_ERR
03D9                    1278     C  POD14_8:
03D9  E4 40             1279     C          IN      AL,TIMER0                       ; GET TIMER VALUE LOW
03DB  8A E0             1280     C          MOV     AH,AL                           ; SAVE IT
03DD  90                1281     C          NOP
03DE  E4 40             1282     C          IN      AL,TIMER0                       ; GET TIMER HIGH
03E0  86 E0             1283     C          XCHG    AH,AL
03E2  90                1284     C          NOP
03E3  90                1285     C          NOP
03E4  3B 46 04          1286     C          CMP     AX,WORD PTR[BP][4]              ; MAXIMUM VERTICAL TIMING
03E7  7D 04             1287     C          JGE     POD14_9
03E9  B3 06             1288     C          MOV     BL,06H
03EB  EB 5B             1289     C          JMP     SHORT POD14_ERR
03ED                    1290     C  POD14_9:
03ED  3B 46 06          1291     C          CMP     AX,WORD PTR[BP][6]              ; MINIMUM VERTICAL TIMING
03F0  7E 04             1292     C          JLE     POD14_10
03F2  B3 07             1293     C          MOV     BL,07H
03F4  EB 52             1294     C          JMP     SHORT POD14_ERR
                        1295     C
                        1296     C  ;----- SEE IF RED, GREEN, BLUE AND INTENSIFY DOTS WORK
                        1297     C
                        1298     C  ;----- FIRST, SET A LINE OF REVERSE VIDEO, INTENSIFIED BLANKS INTO BUFFER
03F6                    1299     C  POD14_10:
03F6  B8 09DB           1300     C          MOV     AX,09DBH                        ; WRITE CHARS, BLANKS
03F9  BB 000F           1301     C          MOV     BX,000FH                        ; PAGE 0, REVERSE VIDEO,
                        1302     C                                                  ;  HIGH INTENSITY
03FC  B9 0050           1303     C          MOV     CX,80                           ; 80 CHARACTERS
03FF  CD 10             1304     C          INT     10H
0401  EC                1305     C          IN      AL,DX
0402  52                1306     C          PUSH    DX                              ; SAVE INPUT STATUS
0403  B2 C0             1307     C          MOV     DL,ATTR_WRITE                   ; ATTRIBUTE ADDRESS
0405  B4 0F             1308     C          MOV     AH,0FH                          ; PALETTE REG 'F'
0407  B0 3F             1309     C          MOV     AL,03FH                         ; TEST VALUE
0409  E8 0D15 R          1310     C          CALL    OUT_DX                          ; VIDEO STATUS MUX
040C  B8 000F           1311     C          MOV     AX,0FH                          ; START WITH BLUE DOTS
040F  5A                1312     C          POP     DX
0410                    1313     C  POD14_13:
0410  50                1314     C          PUSH    AX                              ; SAVE
0411  52                1315     C          PUSH    DX                              ; SAVE INPUT STATUS
0412  B2 C0             1316     C          MOV     DL,ATTR_WRITE                   ; ATTRIBUTE ADDRESS
0414  B4 32             1317     C          MOV     AH,32H                          ; COLOR PLANE ENABLE
0416  E8 0D15 R          1318     C          CALL    OUT_DX                          ; VIDEO STATUS MUX
0419  5A                1319     C          POP     DX                              ; RECOVER INPUT STATUS
041A  58                1320     C          POP     AX
041B  2B C9             1321     C          SUB     CX,CX
                        1322     C  ;----- SEE IF DOT COMES ON
041D                    1323     C  POD14_14:
041D  EC                1324     C          IN      AL,DX                           ; GET STATUS
041E  A8 30             1325     C          TEST    AL,00110000B                    ; DOT THERE?
0420  75 09             1326     C          JNZ     POD14_15                        ; LOOK FOR DOT TO TURN OFF
0422  E2 F9             1327     C          LOOP    POD14_14                        ; CONTINUE TEST FOR DOT ON
0424  B3 10             1328     C          MOV     BL,10H
0426  0A DC             1329     C          OR      BL,AH                           ; OR IN DOT BEING TESTED
0428  EB 1E 90          1330     C          JMP     POD14_ERR                       ; DOT NOT COMING ON
                        1331     C  ;----- SEE IF DOT GOES OFF
042B                    1332     C  POD14_15:
042B  2B C9             1333     C          SUB     CX,CX
042D                    1334     C  POD14_16:
042D  EC                1335     C          IN      AL,DX                           ; GET STATUS
042E  A8 30             1336     C          TEST    AL,00110000B                    ; IS DOT STILL ON?
0430  74 08             1337     C          JE      POD14_17                        ; GO ON IF DOT OFF
0432  E2 F9             1338     C          LOOP    POD14_16                        ; ELSE,KEEP WAITING FOR
                        1339     C                                                  ;  DOT TO GO OFF
0434  B3 20             1340     C          MOV     BL,20H
0436  0A DC             1341     C          OR      BL,AH                           ; OR IN DOT BEING TESTED
0438  EB 0E             1342     C          JMP     SHORT POD14_ERR
                        1343     C
                        1344     C  ;----- ADJUST TO POINT TO NEXT DOT
                        1345     C
043A                    1346     C  POD14_17:
043A  FE C4             1347     C          INC     AH
043C  80 FC 30          1348     C          CMP     AH,030H                         ; ALL 3 DOTS DONE?
043F  74 25             1349     C          JE      POD14_18                        ; GO END
0441  80 CC 0F          1350     C          OR      AH,0FH                          ; MAKE 0F,1F,2F
0444  8A C4             1351     C          MOV     AL,AH
0446  EB C8             1352     C          JMP     POD14_13                        ; GO LOOK FOR ANOTHER DOT
0448                    1353     C  POD14_ERR:
0448  B9 0006           1354     C          MOV     CX,6
044B  BA 0103           1355     C          MOV     DX,0103H                        ; ONE LONG AND THREE SHORT
044E  E8 06C8 R          1356     C          CALL    ERR_BEEP
0451  83 C4 0A          1357     C          ADD     SP,0AH                          ; BALANCE STACK
0454  B0 36             1358     C          MOV     AL,00110110B                    ; RE-INIT TIMER 0
0456  E6 43             1359     C          OUT     TIM_CTL,AL
0458  2A C0             1360     C          SUB     AL,AL
045A  E6 40             1361     C          OUT     TIMER0,AL
045C  90                1362     C          NOP
045D  90                1363     C          NOP
045E  E6 40             1364     C          OUT     TIMER0,AL
0460  BD 0001           1365     C          MOV     BP,1
0463  E9 0091 R          1366     C          JMP     SKIP
                        1367     C          ASSUME DS:ABS0
0466                    1368     C  POD14_18:
0466  E8 0CFE R          1369     C          CALL    DDS
0469  B8 0500           1370     C          MOV     AX,0500H                        ; SET TO VIDEO PAGE 0
046C  CD 10             1371     C          INT     10H
046E  B0 36             1372     C          MOV     AL,00110110B                    ; RE-INIT TIMER 0
0470  E6 43             1373     C          OUT     TIM_CTL,AL
0472  2A C0             1374     C          SUB     AL,AL
0474  E6 40             1375     C          OUT     TIMER0,AL
0476  90                1376     C          NOP
0477  90                1377     C          NOP
0478  E6 40             1378     C          OUT     TIMER0,AL
047A  83 C4 0A          1379     C          ADD     SP,0AH                          ; REMOVE SCRATCH PAD
047D  BD 0000           1380     C          MOV     BP,0                            ; MAKE BP NON ZERO
0480                    1381     C  POD14           ENDP
                        1382     C
                        1383     C  ;----- TEST STORAGE
                        1384     C
0480                    1385     C  MEM_TEST:
0480  1E                1386     C          PUSH    DS
```

```
0481  E8 0CFE R            1387     C          CALL    DDS
                           1388     C          ASSUME  DS:ABS0
0484  F6 06 0487 R 02      1389     C          TEST    INFO,2
0489  74 12                1390     C          JZ      D_COLOR_M
048B  80 0E 0410 R 30      1391     C          OR      EQUIP_LOW,030H
0490  B8 000F              1392     C          MOV     AX,0FH
0493  80 0E 0487 R 60      1393     C          OR      INFO,060H
0498  B8 000F              1394     C          MOV     AX,0FH
049B  EB 0D                1395     C          JMP     SHORT D_OUT_M
049D                       1396     C  D_COLOR_M:
049D  80 26 0410 R CF      1397     C          AND     EQUIP_LOW,0CFH
04A2  80 0E 0410 R 20      1398     C          OR      EQUIP_LOW,020H
04A7  B8 000E              1399     C          MOV     AX,0EH                  ; INTERNAL COLOR MODE
04AA                       1400     C  D_OUT_M:                                ; TEST IN COLOR
04AA  CD 10                1401     C          INT     10H
04AC  83 EC 06             1402     C          SUB     SP,6                    ; RESERVE 3 WORDS ON STACK
04AF  8B EC                1403     C          MOV     BP,SP                   ; SET BP
04B1  B8 A000              1404     C          MOV     AX,0A000H               ; PUT BUFFER ADDRESS IN AX
                           1405     C          ASSUME  DS:NOTHING,ES:NOTHING
04B4  8E D8                1406     C          MOV     DS,AX                   ; SET UP SEG REGS TO POINT
04B6  8E C0                1407     C          MOV     ES,AX                   ;  TO BUFFER AREA
04B8  C7 46 02 0000        1408     C          MOV     WORD PTR[BP][2],0       ; INITIALIZE
04BD  C7 46 04 0000        1409     C          MOV     WORD PTR[BP][4],0       ; INITIALIZE
04C2  B6 03                1410     C          MOV     DH,3
04C4  B2 C4                1411     C          MOV     DL,SEQ_ADDR
04C6  B8 0201              1412     C          MOV     AX,0201H
04C9  E8 0D15 R            1413     C          CALL    OUT_DX
04CC  B2 CE                1414     C          MOV     DL,GRAPH_ADDR           ; ADDRESS READ MAP SELECT
04CE  B8 0400              1415     C          MOV     AX,0400H
04D1  E8 0D15 R            1416     C          CALL    OUT_DX
04D4  52                   1417     C          PUSH    DX
04D5  B2 DA                1418     C          MOV     DL,ATTR_READ            ; SET UP ATTRIBUTE
04D7  EC                   1419     C          IN      AL,DX
04D8  B2 C0                1420     C          MOV     DL,ATTR_WRITE           ; ATTRIBUTE WRITE ADDRESS
04DA  B8 3200              1421     C          MOV     AX,3200H
04DD  E8 0D15 R            1422     C          CALL    OUT_DX
04E0  E8 068F R            1423     C          CALL    HOW_BIG                 ; GO FIND AMOUNT OF MEMORY
04E3  80 FC 00             1424     C          CMP     AH,0
04E6  74 03                1425     C          JZ      AA1
04E8  E9 05CD R            1426     C          JMP     EGA_MEM_ERROR
04EB                       1427     C  AA1:
04EB  E8 05D9 R            1428     C          CALL    MEMORY_OK               ; GO TEST IT
04EE  80 FC 00             1429     C          CMP     AH,0
04F1  74 03                1430     C          JZ      AA2
04F3  E9 05CD R            1431     C          JMP     EGA_MEM_ERROR
04F6                       1432     C  AA2:
04F6  5A                   1433     C          POP     DX
04F7  B2 C4                1434     C          MOV     DL,SEQ_ADDR
04F9  B8 0202              1435     C          MOV     AX,0202H
04FC  E8 0D15 R            1436     C          CALL    OUT_DX
04FF  B2 CE                1437     C          MOV     DL,GRAPH_ADDR           ; ADDRESS OF READ MAP
0501  B8 0401              1438     C          MOV     AX,0401H
0504  E8 0D15 R            1439     C          CALL    OUT_DX
0507  52                   1440     C          PUSH    DX
0508  B2 DA                1441     C          MOV     DL,ATTR_READ            ; SET UP ATTRIBUTE
050A  EC                   1442     C          IN      AL,DX
050B  B2 C0                1443     C          MOV     DL,ATTR_WRITE           ; ATTRIBUTE WRITE ADDRESS
050D  B8 3200              1444     C          MOV     AX,3200H
0510  E8 0D15 R            1445     C          CALL    OUT_DX
0513  C7 46 04 0000        1446     C          MOV     WORD PTR [BP][4],0      ; INITIALIZE
0518  E8 068F R            1447     C          CALL    HOW_BIG                 ; GO FIND AMOUNT OF MEMORY
051B  80 FC 00             1448     C          CMP     AH,0
051E  74 03                1449     C          JZ      AA3
0520  E9 05CD R            1450     C          JMP     EGA_MEM_ERROR
0523                       1451     C  AA3:
0523  E8 05D9 R            1452     C          CALL    MEMORY_OK               ; GO TEST IT
0526  80 FC 00             1453     C          CMP     AH,0
0529  74 03                1454     C          JZ      AA4
052B  E9 05CD R            1455     C          JMP     EGA_MEM_ERROR
052E                       1456     C  AA4:
052E  5A                   1457     C          POP     DX
052F  B2 C4                1458     C          MOV     DL,SEQ_ADDR
0531  B8 0204              1459     C          MOV     AX,0204H
0534  E8 0D15 R            1460     C          CALL    OUT_DX
0537  52                   1461     C          PUSH    DX
0538  B2 CE                1462     C          MOV     DL,GRAPH_ADDR           ; ADDRESS OF READ MAP
053A  B8 0402              1463     C          MOV     AX,0402H
053D  E8 0D15 R            1464     C          CALL    OUT_DX
0540  B2 DA                1465     C          MOV     DL,ATTR_READ            ; SET UP ATTRIBUTE
0542  EC                   1466     C          IN      AL,DX
0543  B2 C0                1467     C          MOV     DL,ATTR_WRITE           ; ATTRIBUTE WRITE ADDRESS
0545  B8 3200              1468     C          MOV     AX,3200H
0548  E8 0D15 R            1469     C          CALL    OUT_DX
054B  C7 46 04 0000        1470     C          MOV     WORD PTR[BP][4],0       ; INITIALIZE
0550  E8 068F R            1471     C          CALL    HOW_BIG                 ; GO FIND AMOUNT OF MEMORY
0553  80 FC 00             1472     C          CMP     AH,0
0556  74 03                1473     C          JZ      AA5
0558  EB 73 90             1474     C          JMP     EGA_MEM_ERROR
055B                       1475     C  AA5:
055B  E8 05D9 R            1476     C          CALL    MEMORY_OK               ; GO TEST IT
055E  80 FC 00             1477     C          CMP     AH,0
0561  74 03                1478     C          JZ      AA6
0563  EB 68 90             1479     C          JMP     EGA_MEM_ERROR
0566                       1480     C  AA6:
0566  5A                   1481     C          POP     DX
0567  B2 C4                1482     C          MOV     DL,SEQ_ADDR
0569  B8 0208              1483     C          MOV     AX,0208H
056C  E8 0D15 R            1484     C          CALL    OUT_DX
056F  B2 CE                1485     C          MOV     DL,GRAPH_ADDR           ; ADDRESS OF READ MAP
0571  B8 0403              1486     C          MOV     AX,0403H
0574  E8 0D15 R            1487     C          CALL    OUT_DX
0577  52                   1488     C          PUSH    DX
0578  B2 DA                1489     C          MOV     DL,ATTR_READ            ; SET UP ATTRIBUTE
057A  EC                   1490     C          IN      AL,DX
057B  B2 C0                1491     C          MOV     DL,ATTR_WRITE           ; ATTRIBUTE WRITE ADDRESS
057D  B8 3200              1492     C          MOV     AX,3200H
0580  E8 0D15 R            1493     C          CALL    OUT_DX
0583  C7 46 04 0000        1494     C          MOV     WORD PTR[BP][4],0       ; INITIALIZE
0588  E8 068F R            1495     C          CALL    HOW_BIG                 ; GO FIND AMOUNT OF MEMORY
058B  80 FC 00             1496     C          CMP     AH,0
058E  75 3D                1497     C          JNZ     EGA_MEM_ERROR
0590  E8 05D9 R            1498     C          CALL    MEMORY_OK               ; GO TEST IT
0593  80 FC 00             1499     C          CMP     AH,0
0596  75 35                1500     C          JNZ     EGA_MEM_ERROR
0598  55                   1501     C          PUSH    BP                      ; SAVE SCRATCH PAD POINTER
0599  BD 0000              1502     C          MOV     BP,0                    ; RESET BP FOR XT
059C                       1503     C  EGA_MEM_EXIT:
059C  5E                   1504     C          POP     SI                      ; RESTORE
059D  5A                   1505     C          POP     DX
059E  E8 0CFE R            1506     C          CALL    DDS                     ; SET DATA SEGMENT
                           1507     C          ASSUME  DS:ABS0
05A1  36: 8B 5C 02         1508     C          MOV     BX,WORD PTR SS:[SI][2]  ; GET EGA MEMORY SIZE
05A5  B1 06                1509     C          MOV     CL,06H                  ; DIVIDE BY 64 TO GET
05A7  D3 EB                1510     C          SHR     BX,CL                   ;  NUMBER OF 64KB BLOCKS
05A9  4B                   1511     C          DEC     BX
05AA  B1 05                1512     C          MOV     CL,05H
```

```
05AC  D3 E3                1513     C          SHL     BX, CL
05AE  80 E3 60             1514     C          AND     BL,01100000B                    ; ISOLATE BITS 5 AND 6
                           1515     C
05B1  80 26 0487 R 9F      1516     C          AND     INFO,10011111B
                           1517     C
05B6  08 1E 0487 R         1518     C          OR      INFO,BL
                           1519     C
05BA  80 0E 0487 R 04      1520     C          OR      INFO,00000100B                  ; 04H  SET 3XX ACTIVE
05BF  8A 1E 0488 R         1521     C          MOV     BL,INFO_3
05C3  E8 00F3 R            1522     C          CALL    MK_ENV
05C6  83 C4 06             1523     C          ADD     SP,6                            ; RESTORE STACK
05C9  1F                   1524     C          POP     DS
05CA  E9 0091 R            1525     C          JMP     SKIP                            ; GO TO END
05CD                       1526     C  EGA_MEM_ERROR:
05CD  BA 0103              1527     C          MOV     DX,0103H                        ; ONE LONG AND THREE SHORT
05D0  E8 06C8 R            1528     C          CALL    ERR_BEEP
05D3  55                   1529     C          PUSH    BP                              ; SAVE SCRATCH PAD POINTER
05D4  BD 0001              1530     C          MOV     BP,1                            ; INDICATE ERROR FOR XT
05D7  EB C3                1531     C          JMP     EGA_MEM_EXIT
                           1532     C
                           1533     C  ;----- THIS ROUTINE FINDS AMOUNT OF MEMORY GOOD
                           1534     C
05D9                       1535     C  MEMORY_OK       PROC    NEAR
05D9  BB A000              1536     C          MOV     BX,0A000H                       ; SET PTR. TO BUFFER SEG
05DC  8E DB                1537     C          MOV     DS,BX                           ; SET SEG.REG.
05DE  8E C3                1538     C          MOV     ES,BX
05E0  8B 46 04             1539     C          MOV     AX,WORD PTR[BP][4]              ; SET COUNT FOR 32K WORDS
05E3  8A E8                1540     C          MOV     CH,AL                           ; SET AMOUNT OF BUFFER
05E5  2A C9                1541     C          SUB     CL,CL                           ;  TO BE TESTED
05E7  D1 E1                1542     C          SHL     CX,1                            ; MULTIPLY BY TWO
05E9  E8 05FB R            1543     C          CALL    PODSTG
05EC  80 FC 00             1544     C          CMP     AH,0                            ; TEST FOR ERROR
05EF  75 09                1545     C          JNZ     MEMORY_OK_ERR                   ; IF ERROR GO PRINT IT
05F1                       1546     C  MEMORY_OK_EX:
05F1  8B 46 04             1547     C          MOV     AX,WORD PTR[BP][4]              ; AMOUNT OF MEMORY FOUND
05F4  01 46 02             1548     C          ADD     WORD PTR[BP][2],AX              ; AMOUNT OF MEMORY GOOD
05F7  B8 0000              1549     C          MOV     AX,0
05FA                       1550     C  MEMORY_OK_ERR:
05FA  C3                   1551     C          RET
05FB                       1552     C  MEMORY_OK       ENDP
                           1553     C
                           1554     C  ;--------------------------------------------------------------------
                           1555     C  ; THIS ROUTINE PERFORMS A READ/WRITE TEST ON A BLOCK OF STORAGE  :
                           1556     C  ; (MAX. SIZE = 32KW). IF "WARM START", FILL BLOCK WITH 0000 AND  :
                           1557     C  ; RETURN.                                                        :
                           1558     C  ; ON ENTRY:                                                      :
                           1559     C  ;   ES = ADDRESS OF STORAGE TO BE TESTED                         :
                           1560     C  ;   DS = ADDRESS OF STORAGE TO BE TESTED                         :
                           1561     C  ;   CX = WORD COUNT OF STORAGE BLOCK TO BE TESTED                :
                           1562     C  ;        (MAX. = 8000H (32K WORDS))                              :
                           1563     C  ; ON EXIT:                                                       :
                           1564     C  ;   ZERO FLAG = OFF IF STORAGE ERROR                            :
                           1565     C  ; AX,BX,CX,DX,DI,SI ARE ALL DESTROYED.                           :
                           1566     C  ;--------------------------------------------------------------------
05FB                       1567     C  PODSTG PROC     NEAR
05FB  55                   1568     C          PUSH    BP
05FC  FC                   1569     C          CLD                                     ; SET DIR TO INCREMENT
05FD  2B FF                1570     C          SUB     DI,DI                           ; SET DI=0000 REL TO START
                           1571     C                                                  ;  OF SEGMENT
05FF  2B C0                1572     C          SUB     AX,AX                           ; INITIAL DATA PATTERN FOR
                           1573     C                                                  ;  00-FF TEST
0601  E8 0CFE R            1574     C          CALL    DDS
                           1575     C          ASSUME  DS:ABS0
0604  8B 1E 0472 R         1576     C          MOV     BX,DS:RESET_FLAG                ; WARM START?
0608  81 FB 1234           1577     C          CMP     BX,1234H
060C  8C C2                1578     C          MOV     DX,ES
060E  8E DA                1579     C          MOV     DS,DX                           ; RESTORE DS
0610  74 62                1580     C          JE      PODSTG_5                        ; GO DO FILL WITH 0000
                           1581     C                                                  ;  IF WARM START
0612  81 FB 4321           1582     C          CMP     BX,4321H                        ; DCP WARM START?
0616  74 5C                1583     C          JE      PODSTG_5                        ; DO FILL IF SO
0618                       1584     C  PODSTG_1:
0618  88 05                1585     C          MOV     [DI],AL                         ; WRITE TEST DATA
061A  8A 05                1586     C          MOV     AL,[DI]                         ; GET IT BACK
061C  32 C4                1587     C          XOR     AL,AH                           ; COMPARE TO EXPECTED
061E  75 40                1588     C          JNZ     PODSTG_ERR0                     ; ERROR EXIT IF MISCOMPARE
0620  FE C4                1589     C          INC     AH                              ; FORM NEW DATA PATTERN
0622  8A C4                1590     C          MOV     AL,AH
0624  75 F2                1591     C          JNZ     PODSTG_1                        ; LOOP TILL ALL 256 DATA
                           1592     C                                                  ;  PATTERNS DONE
0626  8B E9                1593     C          MOV     BP,CX                           ; SAVE WORD COUNT
0628  B8 AA55              1594     C          MOV     AX,0AA55H                       ; LOAD DATA PATTERN
062B  8B D8                1595     C          MOV     BX,AX
062D  BA 55AA              1596     C          MOV     DX,055AAH                       ; LOAD OTHER DATA PATTERN
0630  F3/ AB               1597     C          REP     STOSW                           ; FIL WORDS FROM LOW TO
                           1598     C                                                  ;  HIGH WITH AAAA
0632  4F                   1599     C          DEC     DI                              ; POINT TO LAST WORD
0633  4F                   1600     C          DEC     DI                              ;  WRITTEN
0634  FD                   1601     C          STD                                     ; SET DIR FLAG TO GO DOWN
0635  8B F7                1602     C          MOV     SI,DI                           ; SET INDEX REGS. EQUAL
0637  8B CD                1603     C          MOV     CX,BP                           ; RECOVER WORD COUNT
0639                       1604     C  PODSTG_2:                                       ; GO FROM HIGH TO LOW
0639  AD                   1605     C          LODSW                                   ; GET WORD FROM MEMORY
063A  33 C3                1606     C          XOR     AX,BX                           ; EQUAL WHAT S/B THERE?
063C  75 22                1607     C          JNZ     PODSTG_ERR0                     ; GO ERROR EXIT IF NOT
063E  8B C2                1608     C          MOV     AX,DX                           ; GET 55 DATA PATTERN AND
0640  AB                   1609     C          STOSW                                   ;  STORE IN LOC JUST READ
0641  E2 F6                1610     C          LOOP    PODSTG_2                        ; LOOP TILL ALL BYTES DONE
0643  8B CD                1611     C          MOV     CX,BP                           ; RECOVER WORD COUNT
0645  FC                   1612     C          CLD                                     ; BACK TO INCREMENT
0646  46                   1613     C          INC     SI                              ; ADJUST PTRS
0647  46                   1614     C          INC     SI
0648  8B FE                1615     C          MOV     DI,SI
064A                       1616     C  PODSTG_3:                                       ; LOW TO HIGH DOING WORDS
064A  AD                   1617     C          LODSW                                   ; GET A WORD
064B  33 C2                1618     C          XOR     AX,DX                           ; SHOULD COMPARE TO DX
064D  75 11                1619     C          JNZ     PODSTG_ERR0                     ; GO ERROR IF NOT
064F  AB                   1620     C          STOSW                                   ; WRITE 0000 BACK TO LOC
                           1621     C                                                  ;  JUST READ
0650  E2 F8                1622     C          LOOP    PODSTG_3                        ; LOOP TILL DONE
                           1623     C
0652  FD                   1624     C          STD                                     ; BACK TO DECREMENT
0653  4E                   1625     C          DEC     SI                              ; ADJUST POINTER DOWN TO
                           1626     C                                                  ;  LAST WORD WRITTEN
0654  4E                   1627     C          DEC     SI
0655  8B CD                1628     C          MOV     CX,BP                           ; GET WORD COUNT
0657                       1629     C  PODSTG_4:
0657  AD                   1630     C          LODSW                                   ; GET WORD
0658  0B C0                1631     C          OR      AX,AX                           ; = TO 0000
065A  75 04                1632     C          JNZ     PODSTG_ERR0                     ; ERROR IF NOT
065C  E2 F9                1633     C          LOOP    PODSTG_4                        ; LOOP TILL DONE
065E  EB 11                1634     C          JMP     SHORT PODSTG_ERR2
0660                       1635     C  PODSTG_ERR0:
0660  8B C8                1636     C          MOV     CX,AX                           ; SAVE BITS IN ERROR
0662  32 E4                1637     C          XOR     AH,AH
0664  0A ED                1638     C          OR      CH,CH                           ; HIGH BYTE ERROR?
```

```
0666  74 02                1639     C          JZ      PODSTG_ERR1
0668  B4 01                1640     C          MOV     AH,1                        ; SET HIGH BYTE ERROR
066A                      1641     C  PODSTG_ERR1:
066A  0A C9               1642     C          OR      CL,CL                       ; LOW BYTE ERROR?
066C  74 03               1643     C          JZ      PODSTG_ERR2
066E  80 C4 02            1644     C          ADD     AH,2
0671                      1645     C  PODSTG_ERR2:
0671  5D                  1646     C          POP     BP
0672  FC                  1647     C          CLD                                 ; SET DIR FLAG BACK TO INC
0673  C3                  1648     C          RET                                 ; RETURN TO CALLER
0674                      1649     C  PODSTG_5:                                   ; SIMPLE FILL WITH 0000 ON
                          1650     C                                             ;  WARM-START
0674  50                  1651     C          PUSH    AX                          ; SAVE
0675  52                  1652     C          PUSH    DX                          ; SAVE VALUE
0676  B6 03               1653     C          MOV     DH,3
0678  B2 C4               1654     C          MOV     DL,SEQ_ADDR                 ; SEQ_ADDR REGISTER
067A  B8 020F             1655     C          MOV     AX,020FH
067D  E8 0D15 R           1656     C          CALL    OUT_DX                      ; DO IT
0680  5A                  1657     C          POP     DX                          ; RESTORE
0681  58                  1658     C          POP     AX                          ; RESTORE
0682  F3/ AB              1659     C          REP     STOSW
0684  E8 0CFE R           1660     C          CALL    DDS
                          1661     C          ASSUME  DS:ABS0
0687  89 1E 0472 R        1662     C          MOV     DS:RESET_FLAG,BX
068B  8E DA               1663     C          MOV     DS,DX                       ; RESTORE DS
068D  EB E2               1664     C          JMP     PODSTG_ERR2                 ; AND EXIT
068F                      1665     C  PODSTG ENDP
                          1666     C
                          1667     C  ;----- DETERMINE SIZE OF BUFFER
                          1668     C
068F                      1669     C  HOW_BIG          PROC NEAR
068F  8C DA               1670     C          MOV     DX,DS                       ; SET PNTR TO BUFFER LOC
0691  2B DB               1671     C          SUB     BX,BX                       ; BASIC COUNT OF 00K
0693                      1672     C  FILL_LOOP:
0693  8E C2               1673     C          MOV     ES,DX                       ; SET SEG. REG
0695  2B FF               1674     C          SUB     DI,DI
0697  B8 AA55             1675     C          MOV     AX,0AA55H                   ; TEST PATTERN
069A  8B C8               1676     C          MOV     CX,AX
069C  26: 89 05           1677     C          MOV     ES:[DI],AX                  ; SEND TO MEMORY
069F  B0 0F               1678     C          MOV     AL,0FH                      ; PUT SOMETHING IN AL
06A1  26: 8B 05           1679     C          MOV     AX,ES:[DI]                  ; GET PATTERN FROM MEMORY
06A4  33 C1               1680     C          XOR     AX,CX                       ; COMPARE PATTERNS
06A6  75 14               1681     C          JNZ     HOW_BIG_END                 ; GO END IF NO COMPARE
06A8  B9 2000             1682     C          MOV     CX,2000H                    ; SET COUNT FOR 8K WORDS
06AB  F3/ AB              1683     C  REP     STOSW                               ; FILL 8K WORDS
06AD  81 C2 0400          1684     C          ADD     DX,0400H                    ; POINT TO NEXT 16K BLOCK
06B1  83 C3 10            1685     C          ADD     BX,16                       ; BUMP COUNT BY 16KB
06B4  80 FE B0            1686     C          CMP     DH,0B0H
06B7  75 DA               1687     C          JNZ     FILL_LOOP                   ; AREA YET ?(B0000H)
06B9  EB 01 90            1688     C          JMP     HOW_BIG_END
06BC                      1689     C  HOW_BIG_END:
06BC  80 FE A0            1690     C          CMP     DH,0A0H                     ; 1ST 16KB OK
06BF  74 06               1691     C          JZ      HB_ERROR_EXIT
06C1                      1692     C  RESUME:
06C1  01 5E 04            1693     C          ADD     WORD PTR[BP][4],BX          ; SAVE BUFFER FOUND
06C4  B8 0000             1694     C          MOV     AX,0
06C7                      1695     C  HB_ERROR_EXIT:
06C7  C3                  1696     C          RET
06C8                      1697     C  HOW_BIG          ENDP
                          1698     C
                          1699     C  ;----------------------------------------
                          1700     C  ;SUBROUTINES FOR POWER ON DIAGNOSTICS  :
                          1701     C  ;-------------------------------------------------------------------
                          1702     C  ;THIS PROCEDURE WILL ISSUE ONE LONG TONE (3 SEC) AND ONE OR     :
                          1703     C  ;MORE SHORT TONES (1 SEC) TO INDICATE A FAILURE ON THE PLANAR   :
                          1704     C  ;BOARD ,A BAD RAM MODULE,OR A PROBLEM WITH THE CRT.             :
                          1705     C  ;ENTRY REQUIREMENTS:                                           :
                          1706     C  ;       DH=NUMBER OF LONG TONES TO BEEP                        :
                          1707     C  ;       DL=NUMBER OF SHORT TONES TO BEEP.                      :
                          1708     C  ;-------------------------------------------------------------------
06C8                      1709     C  ERR_BEEP PROC    NEAR
06C8  9C                  1710     C          PUSHF                               ; SAVE FLAGS
06C9  FA                  1711     C          CLI                                 ; DISABLE SYSTEM INTS
06CA  1E                  1712     C          PUSH    DS
06CB  E8 0CFE R           1713     C          CALL    DDS
                          1714     C          ASSUME  DS:ABS0
06CE  0A F6               1715     C          OR      DH,DH                       ; ANY LONG TONES TO BEEP
06D0  74 0B               1716     C          JZ      G3                          ; NO, DO THE SHORT ONES
06D2                      1717     C  G1:                                        ; LONG BEEP
06D2  B3 06               1718     C          MOV     BL,6                        ; COUNTER FOR BEEPS
06D4  E8 0D20 R           1719     C          CALL    BEEP                        ; DO THE BEEP
06D7                      1720     C  G2:
06D7  E2 FE               1721     C          LOOP    G2                          ; DELAY BETWEEN BEEPS
06D9  FE CE               1722     C          DEC     DH                          ; ANY MORE TO DO
06DB  75 F5               1723     C          JNZ     G1                          ; DO IT
06DD                      1724     C  G3:
06DD  B3 01               1725     C          MOV     BL,1                        ; COUNTER FOR A SHORT BEEP
06DF  E8 0D20 R           1726     C          CALL    BEEP                        ; DO IT
06E2                      1727     C  G4:
06E2  E2 FE               1728     C          LOOP    G4                          ; DELAY BETWEEN BEEPS
06E4  FE CA               1729     C          DEC     DL                          ; DONE WITH SHORT BEEPS
06E6  75 F5               1730     C          JNZ     G3                          ; DO MORE
06E8                      1731     C  G5:
06E8  E2 FE               1732     C          LOOP G5                             ; DELAY BEFORE RETURN
06EA                      1733     C  G6:
06EA  E2 FE               1734     C          LOOP G6
06EC  1F                  1735     C          POP     DS                          ; RESTORE CONTENTS OF DS
06ED  9D                  1736     C          POPF                                ; RESTORE FLAGS
06EE  C3                  1737     C          RET
06EF                      1738     C  ERR_BEEP         ENDP
                          1739     C
                          1740     C          SUBTTL
                          1741
                          1742
06EF                      1743        T2      LABEL   WORD
06EF  0EB3 R              1744                DW      OFFSET AH0                  ; MODE SET
06F1  10EF R              1745                DW      OFFSET AH1                  ; SET CURSOR TYPE
06F3  1157 R              1746                DW      OFFSET AH2                  ; SET CURSOR POSITION
06F5  1186 R              1747                DW      OFFSET AH3                  ; READ CURSOR POSITION
06F7  119D R              1748                DW      OFFSET AH4                  ; READ LIGHT PEN POSITION
06F9  12A4 R              1749                DW      OFFSET AH5                  ; ACTIVE DISPLAY PAGE
06FB  150E R              1750                DW      OFFSET AH6                  ; SCROLL DOWN
06FD  15B0 R              1751                DW      OFFSET AH7                  ; SCROLL UP
06FF  17D2 R              1752                DW      OFFSET AH8                  ; READ CHAR/ATTRIBUTE
0701  1899 R              1753                DW      OFFSET AH9                  ; WRITE CHAR/ATTRIBUTE
0703  18DD R              1754                DW      OFFSET AHA                  ; WRITE CHARACTER ONLY
0705  1A75 R              1755                DW      OFFSET AHB                  ; SET COLOR PALETTE
0707  1BCB R              1756                DW      OFFSET AHC                  ; WRITE DOT
0709  1C9F R              1757                DW      OFFSET AHD                  ; READ DOT
070B  1D01 R              1758                DW      OFFSET AHE                  ; WRITE TTY
070D  1D85 R              1759                DW      OFFSET AHF                  ; CURRENT VIDEO STATE
070F  1DC5 R              1760                DW      OFFSET AH10                 ; SET PALETTE REGISTERS
0711  1F98 R              1761                DW      OFFSET AH11                 ; CHAR GENERATOR ROUTINE
0713  20BF R              1762                DW      OFFSET AH12                 ; ALTERNATE SELECT
0715  2118 R              1763                DW      OFFSET AH13                 ; WRITE STRING
= 0028                    1764        T2L     EQU     $-T2
```

```
                                1765
                                1766     C          INCLUDE         VPARMS.INC
                                1767     C          SUBTTL  VPARMS.INC
                                1768     C          PAGE
0717                            1769     C  VIDEO_PARMS     LABEL BYTE
                                1770     C
                                1771     C  ; STRUCTURE OF THIS TABLE
                                1772     C  ;
                                1773     C  ;       COLUMNS, ROWS, PELS PER CHARACTER
                                1774     C  ;       PAGE LENGTH
                                1775     C  ;       SEQUENCER PARAMETERS
                                1776     C  ;       MISCELLANEOUS REGISTER.
                                1777     C  ;       CRTC PARAMETERS
                                1778     C  ;       ATTRIBUTE PARAMETERS
                                1779     C  ;       GRAPHICS PARAMETERS
                                1780     C
= 0000                          1781     C  BASE_1 EQU      $ - VIDEO_PARMS
0717                            1782     C  BASE_1_L        LABEL BYTE
                                1783     C
                                1784     C  ;----- DEFAULT MODES
                                1785     C
                                1786     C  ;--0--
0717  28 18 08                  1787     C          DB      40D,24D,08D
071A  0800                      1788     C          DW      00800H
                                1789     C
= 0005                          1790     C  TFS_LEN EQU     $ - BASE_1_L
                                1791     C
071C                            1792     C  SEQ_PARMS       LABEL BYTE
071C  0B 03 00 03               1793     C          DB      00BH,003H,000H,003H
= 0004                          1794     C  M1      EQU     $ - SEQ_PARMS
                                1795     C
0720  23                        1796     C          DB      023H
                                1797     C
0721                            1798     C  CRT_PARMS       LABEL BYTE
0721  37 27 2D 37 31 15         1799     C          DB      037H,027H,02DH,037H,031H,015H
0727  04 11 00 07 06 07         1800     C          DB      004H,011H,000H,007H,006H,007H
072D  00 00 00 00 E1 24         1801     C          DB      000H,000H,000H,000H,0E1H,024H
0733  C7 14 08 E0 F0 A3         1802     C          DB      0C7H,014H,008H,0E0H,0F0H,0A3H
0739  FF                        1803     C          DB      0FFH
= 0019                          1804     C  M4      EQU     $-CRT_PARMS
                                1805     C
= 0023                          1806     C  LN_4    EQU     $ - BASE_1_L
                                1807     C
073A                            1808     C  ATTR_PARMS      LABEL BYTE
073A  00 01 02 03 04 05         1809     C          DB      000H,001H,002H,003H,004H,005H
0740  06 07 10 11 12 13         1810     C          DB      006H,007H,010H,011H,012H,013H
0746  14 15 16 17 08 00         1811     C          DB      014H,015H,016H,017H,008H,000H
074C  0F 00                     1812     C          DB      00FH,000H
= 0014                          1813     C  M5      EQU     $-ATTR_PARMS
                                1814     C
= 0037                          1815     C  LN_2    EQU     $ - BASE_1_L
074E                            1816     C  GRAPH_PARMS     LABEL BYTE
074E  00 00 00 00 00 10         1817     C          DB      000H,000H,000H,000H,000H,010H
0754  0E 00 FF                  1818     C          DB      00EH,000H,0FFH
= 0009                          1819     C  M6      EQU     $-GRAPH_PARMS
                                1820     C
= 0040                          1821     C  M_TBL_LEN       EQU     $ - BASE_1_L
                                1822     C
                                1823     C  ;--1--
0757  28 18 08                  1824     C          DB      40D,24D,08D
075A  0800                      1825     C          DW      00800H
                                1826     C
075C  0B 03 00 03               1827     C          DB      00BH,003H,000H,003H
                                1828     C
0760  23                        1829     C          DB      023H
                                1830     C
0761  37 27 2D 37 31 15         1831     C          DB      037H,027H,02DH,037H,031H,015H
0767  04 11 00 07 06 07         1832     C          DB      004H,011H,000H,007H,006H,007H
076D  00 00 00 00 E1 24         1833     C          DB      000H,000H,000H,000H,0E1H,024H
0773  C7 14 08 E0 F0 A3         1834     C          DB      0C7H,014H,008H,0E0H,0F0H,0A3H
0779  FF                        1835     C          DB      0FFH
                                1836     C
077A  00 01 02 03 04 05         1837     C          DB      000H,001H,002H,003H,004H,005H
0780  06 07 10 11 12 13         1838     C          DB      006H,007H,010H,011H,012H,013H
0786  14 15 16 17 08 00         1839     C          DB      014H,015H,016H,017H,008H,000H
078C  0F 00                     1840     C          DB      00FH,000H
                                1841     C
078E  00 00 00 00 00 10         1842     C          DB      000H,000H,000H,000H,000H,010H
0794  0E 00 FF                  1843     C          DB      00EH,000H,0FFH
                                1844     C
                                1845     C  ;--2--
0797  50 18 08                  1846     C          DB      80D,24D,08D
079A  1000                      1847     C          DW      01000H
                                1848     C
079C  01 03 00 03               1849     C          DB      001H,003H,000H,003H
                                1850     C
07A0  23                        1851     C          DB      023H
                                1852     C
07A1  70 4F 5C 2F 5F 07         1853     C          DB      070H,04FH,05CH,02FH,05FH,007H
07A7  04 11 00 07 06 07         1854     C          DB      004H,011H,000H,007H,006H,007H
07AD  00 00 00 00 E1 24         1855     C          DB      000H,000H,000H,000H,0E1H,024H
07B3  C7 28 08 E0 F0 A3         1856     C          DB      0C7H,028H,008H,0E0H,0F0H,0A3H
07B9  FF                        1857     C          DB      0FFH
                                1858     C
07BA  00 01 02 03 04 05         1859     C          DB      000H,001H,002H,003H,004H,005H
07C0  06 07 10 11 12 13         1860     C          DB      006H,007H,010H,011H,012H,013H
07C6  14 15 16 17 08 00         1861     C          DB      014H,015H,016H,017H,008H,000H
07CC  0F 00                     1862     C          DB      00FH,000H
                                1863     C
07CE  00 00 00 00 00 10         1864     C          DB      000H,000H,000H,000H,000H,010H
07D4  0E 00 FF                  1865     C          DB      00EH,000H,0FFH
                                1866     C
                                1867     C  ;--3--
07D7  50 18 08                  1868     C          DB      80D,24D,08D
07DA  1000                      1869     C          DW      01000H
                                1870     C
07DC  01 03 00 03               1871     C          DB      001H,003H,000H,003H
                                1872     C
07E0  23                        1873     C          DB      023H
                                1874     C
07E1  70 4F 5C 2F 5F 07         1875     C          DB      070H,04FH,05CH,02FH,05FH,007H
07E7  04 11 00 07 06 07         1876     C          DB      004H,011H,000H,007H,006H,007H
07ED  00 00 00 00 E1 24         1877     C          DB      000H,000H,000H,000H,0E1H,024H
07F3  C7 28 08 E0 F0 A3         1878     C          DB      0C7H,028H,008H,0E0H,0F0H,0A3H
07F9  FF                        1879     C          DB      0FFH
                                1880     C
07FA  00 01 02 03 04 05         1881     C          DB      000H,001H,002H,003H,004H,005H
0800  06 07 10 11 12 13         1882     C          DB      006H,007H,010H,011H,012H,013H
0806  14 15 16 17 08 00         1883     C          DB      014H,015H,016H,017H,008H,000H
080C  0F 00                     1884     C          DB      00FH,000H
                                1885     C
080E  00 00 00 00 00 10         1886     C          DB      000H,000H,000H,000H,000H,010H
0814  0E 00 FF                  1887     C          DB      00EH,000H,0FFH
                                1888     C
                                1889     C  ;--4--
0817  28 18 08                  1890     C          DB      40D,24D,08D
```

```
081A  4000                    1891     C          DW      04000H
                              1892     C
081C  0B 03 00 02             1893     C          DB      00BH,003H,000H,002H
                              1894     C
0820  23                      1895     C          DB      023H
                              1896     C
0821  37 27 2D 37 30 14       1897     C          DB      037H,027H,02DH,037H,030H,014H
0827  04 11 00 01 00 00       1898     C          DB      004H,011H,000H,001H,000H,000H
082D  00 00 00 00 E1 24       1899     C          DB      000H,000H,000H,000H,0E1H,024H
0833  C7 14 00 E0 F0 A2       1900     C          DB      0C7H,014H,000H,0E0H,0F0H,0A2H
0839  FF                      1901     C          DB      0FFH
                              1902     C
083A  00 13 15 17 02 04       1903     C          DB      000H,013H,015H,017H,002H,004H
0840  06 07 10 11 12 13       1904     C          DB      006H,007H,010H,011H,012H,013H
0846  14 15 16 17 01 00       1905     C          DB      014H,015H,016H,017H,001H,000H
084C  03 00                   1906     C          DB      003H,000H
                              1907     C
084E  00 00 00 00 00 30       1908     C          DB      000H,000H,000H,000H,000H,030H
0854  0F 00 FF                1909     C          DB      00FH,000H,0FFH
                              1910     C
                              1911     C  ;--5--
0857  28 18 08                1912     C          DB      40D,24D,08D
085A  4000                    1913     C          DW      04000H
                              1914     C
085C  0B 03 00 02             1915     C          DB      00BH,003H,000H,002H
                              1916     C
0860  23                      1917     C          DB      023H
                              1918     C
0861  37 27 2D 37 30 14       1919     C          DB      037H,027H,02DH,037H,030H,014H
0867  04 11 00 01 00 00       1920     C          DB      004H,011H,000H,001H,000H,000H
086D  00 00 00 00 E1 24       1921     C          DB      000H,000H,000H,000H,0E1H,024H
0873  C7 14 00 E0 F0 A2       1922     C          DB      0C7H,014H,000H,0E0H,0F0H,0A2H
0879  FF                      1923     C          DB      0FFH
                              1924     C
087A  00 13 15 17 02 04       1925     C          DB      000H,013H,015H,017H,002H,004H
0880  06 07 10 11 12 13       1926     C          DB      006H,007H,010H,011H,012H,013H
0886  14 15 16 17 01 00       1927     C          DB      014H,015H,016H,017H,001H,000H
088C  03 00                   1928     C          DB      003H,000H
                              1929     C
088E  00 00 00 00 00 30       1930     C          DB      000H,000H,000H,000H,000H,030H
0894  0F 00 FF                1931     C          DB      00FH,000H,0FFH
                              1932     C
                              1933     C  ;--6--
0897  50 18 08                1934     C          DB      80D,24D,08D
089A  4000                    1935     C          DW      04000H
                              1936     C
089C  01 01 00 06             1937     C          DB      001H,001H,000H,006H
                              1938     C
08A0  23                      1939     C          DB      023H
                              1940     C
08A1  70 4F 59 2D 5E 06       1941     C          DB      070H,04FH,059H,02DH,05EH,0006H
08A7  04 11 00 01 00 00       1942     C          DB      004H,011H,000H,001H,000H,000H
08AD  00 00 00 00 E0 23       1943     C          DB      000H,000H,000H,000H,0E0H,023H
08B3  C7 28 00 DF EF C2       1944     C          DB      0C7H,028H,000H,0DFH,0EFH,0C2H
08B9  FF                      1945     C          DB      0FFH
                              1946     C
08BA  00 17 17 17 17 17       1947     C          DB      000H,017H,017H,017H,017H,017H
08C0  17 17 17 17 17 17       1948     C          DB      017H,017H,017H,017H,017H,017H
08C6  17 17 17 17 01 00       1949     C          DB      017H,017H,017H,017H,001H,000H
08CC  01 00                   1950     C          DB      001H,000H
                              1951     C
08CE  00 00 00 00 00 00       1952     C          DB      000H,000H,000H,000H,000H,000H
08D4  0D 00 FF                1953     C          DB      00DH,000H,0FFH
                              1954     C
                              1955     C  ;--7--
08D7  50 18 0E                1956     C          DB      80D,24D,14D
08DA  1000                    1957     C          DW      01000H
                              1958     C
08DC  00 03 00 03             1959     C          DB      000H,003H,000H,003H
                              1960     C
08E0  A6                      1961     C          DB      0A6H
                              1962     C
08E1  60 4F 56 3A 51 60       1963     C          DB      060H,04FH,056H,03AH,051H,060H
08E7  70 1F 00 0D 0B 0C       1964     C          DB      070H,01FH,000H,00DH,00BH,00CH
08ED  00 00 00 00 5E 2E       1965     C          DB      000H,000H,000H,000H,05EH,02EH
08F3  5D 28 0D 5E 6E A3       1966     C          DB      05DH,028H,00DH,05EH,06EH,0A3H
08F9  FF                      1967     C          DB      0FFH
                              1968     C
08FA  00 08 08 08 08 08       1969     C          DB      000H,008H,008H,008H,008H,008H
0900  08 08 10 18 18 18       1970     C          DB      008H,008H,010H,018H,018H,018H
0906  18 18 18 18 0E 00       1971     C          DB      018H,018H,018H,018H,00EH,000H
090C  0F 08                   1972     C          DB      00FH,008H
                              1973     C
090E  00 00 00 00 00 10       1974     C          DB      000H,000H,000H,000H,000H,010H
0914  0A 00 FF                1975     C          DB      00AH,000H,0FFH
                              1976     C
                              1977     C  ;--8--
0917  28 18 08                1978     C          DB      40D,24D,08D
091A  4000                    1979     C          DW      04000H
                              1980     C
091C  00 00 00 03             1981     C          DB      000H,000H,000H,003H
                              1982     C
0920  23                      1983     C          DB      023H
                              1984     C
0921  37 27 2D 37 31 15       1985     C          DB      037H,027H,02DH,037H,031H,015H
0927  04 11 00 07 06 07       1986     C          DB      004H,011H,000H,007H,006H,007H
092D  00 00 00 00 E1 24       1987     C          DB      000H,000H,000H,000H,0E1H,024H
0933  C7 14 08 E0 F0 A3       1988     C          DB      0C7H,014H,008H,0E0H,0F0H,0A3H
0939  FF                      1989     C          DB      0FFH
                              1990     C
093A  00 01 02 03 04 05       1991     C          DB      000H,001H,002H,003H,004H,005H
0940  06 07 10 11 12 13       1992     C          DB      006H,007H,010H,011H,012H,013H
0946  14 15 16 17 08 00       1993     C          DB      014H,015H,016H,017H,008H,000H
094C  0F 00                   1994     C          DB      00FH,000H
                              1995     C
094E  00 00 00 00 00 10       1996     C          DB      000H,000H,000H,000H,000H,010H
0954  0E 00 FF                1997     C          DB      00EH,000H,0FFH
                              1998     C
                              1999     C  ;--9--
0957  28 18 08                2000     C          DB      40D,24D,08D
095A  4000                    2001     C          DW      04000H
                              2002     C
095C  00 00 00 03             2003     C          DB      000H,000H,000H,003H
                              2004     C
0960  23                      2005     C          DB      023H
                              2006     C
0961  37 27 2D 37 31 15       2007     C          DB      037H,027H,02DH,037H,031H,015H
0967  04 11 00 07 06 07       2008     C          DB      004H,011H,000H,007H,006H,007H
096D  00 00 00 00 E1 24       2009     C          DB      000H,000H,000H,000H,0E1H,024H
0973  C7 14 08 E0 F0 A3       2010     C          DB      0C7H,014H,008H,0E0H,0F0H,0A3H
0979  FF                      2011     C          DB      0FFH
                              2012     C
097A  00 01 02 03 04 05       2013     C          DB      000H,001H,002H,003H,004H,005H
0980  06 07 10 11 12 13       2014     C          DB      006H,007H,010H,011H,012H,013H
0986  14 15 16 17 08 00       2015     C          DB      014H,015H,016H,017H,008H,000H
098C  0F 00                   2016     C          DB      00FH,000H
```

```
                                        2017     C
098E  00 00 00 00 00 10                 2018     C               DB      000H,000H,000H,000H,000H,010H
0994  0E 00 FF                          2019     C               DB      00EH,000H,0FFH
                                        2020     C
                                        2021     C  ;--A--
0997  28 18 08                          2022     C               DB      40D,24D,08D
099A  4000                              2023     C               DW      04000H
                                        2024     C
099C  00 00 00 03                       2025     C               DB      000H,000H,000H,003H
                                        2026     C
09A0  23                                2027     C               DB      023H
                                        2028     C
09A1  37 27 2D 37 31 15                 2029     C               DB      037H,027H,02DH,037H,031H,015H
09A7  04 11 00 07 06 07                 2030     C               DB      004H,011H,000H,007H,006H,007H
09AD  00 00 00 00 E1 24                 2031     C               DB      000H,000H,000H,000H,0E1H,024H
09B3  C7 14 08 E0 F0 A3                 2032     C               DB      0C7H,014H,008H,0E0H,0F0H,0A3H
09B9  FF                                2033     C               DB      0FFH
                                        2034     C
09BA  00 01 02 03 04 05                 2035     C               DB      000H,001H,002H,003H,004H,005H
09C0  06 07 10 11 12 13                 2036     C               DB      006H,007H,010H,011H,012H,013H
09C6  14 15 16 17 08 00                 2037     C               DB      014H,015H,016H,017H,008H,000H
09CC  0F 00                             2038     C               DB      00FH,000H
                                        2039     C
09CE  00 00 00 00 00 10                 2040     C               DB      000H,000H,000H,000H,000H,010H
09D4  0E 00 FF                          2041     C               DB      00EH,000H,0FFH
                                        2042     C
                                        2043     C  ;--B--
09D7  50 18 08                          2044     C               DB      80D,24D,08D
09DA  1000                              2045     C               DW      01000H
                                        2046     C
09DC  01 04 00 07                       2047     C               DB      001H,004H,000H,007H
                                        2048     C
09E0  23                                2049     C               DB      023H
                                        2050     C
09E1  70 4F 5C 2F 5F 07                 2051     C               DB      070H,04FH,05CH,02FH,05FH,007H
09E7  04 11 00 07 06 07                 2052     C               DB      004H,011H,000H,007H,006H,007H
09ED  00 00 00 00 E1 24                 2053     C               DB      000H,000H,000H,000H,0E1H,024H
09F3  C7 28 08 E0 F0 A3                 2054     C               DB      0C7H,028H,008H,0E0H,0F0H,0A3H
09F9  FF                                2055     C               DB      0FFH
                                        2056     C
09FA  00 00 00 00 00 00                 2057     C               DB      000H,000H,000H,000H,000H,000H
0A00  00 00 00 00 00 00                 2058     C               DB      000H,000H,000H,000H,000H,000H
0A06  00 00 00 00 00 00                 2059     C               DB      000H,000H,000H,000H,000H,000H
0A0C  0F 00                             2060     C               DB      00FH,000H
                                        2061     C
0A0E  00 00 00 00 00 00                 2062     C               DB      000H,000H,000H,000H,000H,000H
0A14  04 00 FF                          2063     C               DB      004H,000H,0FFH
                                        2064     C  ;--C--
0A17  50 18 0E                          2065     C               DB      80D,24D,14D
0A1A  1000                              2066     C               DW      01000H
                                        2067     C
0A1C  00 04 00 07                       2068     C               DB      000H,004H,000H,007H
                                        2069     C
0A20  A6                                2070     C               DB      0A6H
                                        2071     C
0A21  60 4F 56 3A 51 60                 2072     C               DB      060H,04FH,056H,03AH,051H,060H
0A27  70 1F 00 0D 0B 0C                 2073     C               DB      070H,01FH,000H,00DH,00BH,00CH
0A2D  00 00 00 00 5E 2E                 2074     C               DB      000H,000H,000H,000H,05EH,02EH
0A33  5D 28 0D 5E 6E A3                 2075     C               DB      05DH,028H,00DH,05EH,06EH,0A3H
0A39  FF                                2076     C               DB      0FFH
                                        2077     C
0A3A  00 00 00 00 00 00                 2078     C               DB      000H,000H,000H,000H,000H,000H
0A40  00 00 00 00 00 00                 2079     C               DB      000H,000H,000H,000H,000H,000H
0A46  00 00 00 00 0E 00                 2080     C               DB      000H,000H,000H,000H,00EH,000H
0A4C  0F 08                             2081     C               DB      00FH,008H
                                        2082     C
0A4E  00 00 00 00 00 00                 2083     C               DB      000H,000H,000H,000H,000H,000H
0A54  04 00 FF                          2084     C               DB      004H,000H,0FFH
                                        2085     C  ;--D--
0A57  28 18 08                          2086     C               DB      40D,24D,08D
0A5A  2000                              2087     C               DW      02000H
                                        2088     C
0A5C  0B 0F 00 06                       2089     C               DB      00BH,00FH,000H,006H
                                        2090     C
0A60  23                                2091     C               DB      023H
                                        2092     C
0A61  37 27 2D 37 30 14                 2093     C               DB      037H,027H,02DH,037H,030H,014H
0A67  04 11 00 00 00 00                 2094     C               DB      004H,011H,000H,000H,000H,000H
0A6D  00 00 00 00 E1 24                 2095     C               DB      000H,000H,000H,000H,0E1H,024H
0A73  C7 14 00 E0 F0 E3                 2096     C               DB      0C7H,014H,000H,0E0H,0F0H,0E3H
0A79  FF                                2097     C               DB      0FFH
                                        2098     C
0A7A  00 01 02 03 04 05                 2099     C               DB      000H,001H,002H,003H,004H,005H
0A80  06 07 10 11 12 13                 2100     C               DB      006H,007H,010H,011H,012H,013H
0A86  14 15 16 17 01 00                 2101     C               DB      014H,015H,016H,017H,001H,000H
0A8C  0F 00                             2102     C               DB      00FH,000H
                                        2103     C
0A8E  00 00 00 00 00 00                 2104     C               DB      000H,000H,000H,000H,000H,000H
0A94  05 0F FF                          2105     C               DB      005H,00FH,0FFH
                                        2106     C  ;--E--
0A97  50 18 08                          2107     C               DB      80D,24D,08D
0A9A  4000                              2108     C               DW      04000H
                                        2109     C
0A9C  01 0F 00 06                       2110     C               DB      001H,00FH,000H,006H
                                        2111     C
0AA0  23                                2112     C               DB      023H
                                        2113     C
0AA1  70 4F 59 2D 5E 06                 2114     C               DB      070H,04FH,059H,02DH,05EH,006H
0AA7  04 11 00 00 00 00                 2115     C               DB      004H,011H,000H,000H,000H,000H
0AAD  00 00 00 00 E0 23                 2116     C               DB      000H,000H,000H,000H,0E0H,023H
0AB3  C7 28 00 DF EF E3                 2117     C               DB      0C7H,028H,000H,0DFH,0EFH,0E3H
0AB9  FF                                2118     C               DB      0FFH
                                        2119     C
0ABA  00 01 02 03 04 05                 2120     C               DB      000H,001H,002H,003H,004H,005H
0AC0  06 07 10 11 12 13                 2121     C               DB      006H,007H,010H,011H,012H,013H
0AC6  14 15 16 17 01 00                 2122     C               DB      014H,015H,016H,017H,001H,000H
0ACC  0F 00                             2123     C               DB      00FH,000H
                                        2124     C
0ACE  00 00 00 00 00 00                 2125     C               DB      000H,000H,000H,000H,000H,000H
0AD4  05 0F FF                          2126     C               DB      005H,00FH,0FFH
                                        2127     C  ;--F--
0AD7  50 18 0E                          2128     C               DB      80D,24D,14D
0ADA  8000                              2129     C               DW      08000H
                                        2130     C
0ADC  05 0F 00 00                       2131     C               DB      005H,00FH,000H,000H
                                        2132     C
0AE0  A2                                2133     C               DB      0A2H
                                        2134     C
0AE1  60 4F 56 1A 50 E0                 2135     C               DB      060H,04FH,056H,01AH,050H,0E0H
0AE7  70 1F 00 00 00 00                 2136     C               DB      070H,01FH,000H,000H,000H,000H
0AED  00 00 00 00 5E 2E                 2137     C               DB      000H,000H,000H,000H,05EH,02EH
0AF3  5D 14 0D 5E 6E 8B                 2138     C               DB      05DH,014H,00DH,05EH,06EH,08BH
0AF9  FF                                2139     C               DB      0FFH
                                        2140     C
0AFA  00 08 00 00 18 18                 2141     C               DB      000H,008H,000H,000H,018H,018H
0B00  00 00 00 08 00 00                 2142     C               DB      000H,000H,000H,008H,000H,000H
```

```
0B06  00 18 00 00 0B 00     2143     C          DB      000H,018H,000H,000H,00BH,000H
0B0C  05 00                 2144     C          DB      005H,000H
                            2145     C
0B0E  00 00 00 00 00 10     2146     C          DB      000H,000H,000H,000H,000H,010H
0B14  07 0F FF              2147     C          DB      007H,00FH,0FFH
                            2148     C  ;-10--
0B17  50 18 0E              2149     C          DB      80D,24D,14D
0B1A  8000                  2150     C          DW      08000H
                            2151     C
0B1C  05 0F 00 00           2152     C          DB      005H,00FH,000H,000H
                            2153     C
0B20  A7                    2154     C          DB      0A7H
                            2155     C
0B21  5B 4F 53 17 50 BA     2156     C          DB      05BH,04FH,053H,017H,050H,0BAH
0B27  6C 1F 00 00 00 00     2157     C          DB      06CH,01FH,000H,000H,000H,000H
0B2D  00 00 00 00 5E 2B     2158     C          DB      000H,000H,000H,000H,05EH,02BH
0B33  5D 14 0F 5F 0A 8B     2159     C          DB      05DH,014H,00FH,05FH,00AH,08BH
0B39  FF                    2160     C          DB      0FFH
                            2161     C
0B3A  00 01 00 00 04 07     2162     C          DB      000H,001H,000H,000H,004H,007H
0B40  00 00 00 01 00 00     2163     C          DB      000H,000H,000H,001H,000H,000H
0B46  04 07 00 00 01 00     2164     C          DB      004H,007H,000H,000H,001H,000H
0B4C  05 00                 2165     C          DB      005H,000H
                            2166     C
0B4E  00 00 00 00 00 10     2167     C          DB      000H,000H,000H,000H,000H,010H
0B54  07 0F FF              2168     C          DB      007H,00FH,0FFH
                            2169     C
= 0440                      2170     C  BASE_2  EQU     $ - VIDEO_PARMS
                            2171     C
                            2172     C  ;-----   > 16K MODE VALUES
                            2173     C
                            2174     C  ;--F--
0B57  50 18 0E              2175     C          DB      80D,24D,14D
0B5A  8000                  2176     C          DW      08000H
                            2177     C
0B5C  01 0F 00 06           2178     C          DB      001H,00FH,000H,006H
                            2179     C
0B60  A2                    2180     C          DB      0A2H
                            2181     C
0B61  60 4F 56 3A 50 60     2182     C          DB      060H,04FH,056H,03AH,050H,060H
0B67  70 1F 00 00 00 00     2183     C          DB      070H,01FH,000H,000H,000H,000H
0B6D  00 00 00 00 5E 2E     2184     C          DB      000H,000H,000H,000H,05EH,02EH
0B73  5D 28 0D 5E 6E E3     2185     C          DB      05DH,028H,00DH,05EH,06EH,0E3H
0B79  FF                    2186     C          DB      0FFH
                            2187     C
0B7A  00 08 00 00 18 18     2188     C          DB      000H,008H,000H,000H,018H,018H
0B80  00 00 00 08 00 00     2189     C          DB      000H,000H,000H,008H,000H,000H
0B86  00 18 00 00 0B 00     2190     C          DB      000H,018H,000H,000H,00BH,000H
0B8C  05 00                 2191     C          DB      005H,000H
                            2192     C
0B8E  00 00 00 00 00 00     2193     C          DB      000H,000H,000H,000H,000H,000H
0B94  05 0F FF              2194     C          DB      005H,00FH,0FFH
                            2195     C
                            2196     C  ;-10--
0B97  50 18 0E              2197     C          DB      80D,24D,14D
0B9A  8000                  2198     C          DW      08000H
                            2199     C
0B9C  01 0F 00 06           2200     C          DB      001H,00FH,000H,006H
                            2201     C
0BA0  A7                    2202     C          DB      0A7H
                            2203     C
0BA1  5B 4F 53 37 52 00     2204     C          DB      05BH,04FH,053H,037H,052H,000H
0BA7  6C 1F 00 00 00 00     2205     C          DB      06CH,01FH,000H,000H,000H,000H
0BAD  00 00 00 00 5E 2B     2206     C          DB      000H,000H,000H,000H,05EH,02BH
0BB3  5D 28 0F 5F 0A E3     2207     C          DB      05DH,028H,00FH,05FH,00AH,0E3H
0BB9  FF                    2208     C          DB      0FFH
                            2209     C
0BBA  00 01 02 03 04 05     2210     C          DB      000H,001H,002H,003H,004H,005H
0BC0  14 07 38 39 3A 3B     2211     C          DB      014H,007H,038H,039H,03AH,03BH
0BC6  3C 3D 3E 3F 01 00     2212     C          DB      03CH,03DH,03EH,03FH,001H,000H
0BCC  0F 00                 2213     C          DB      00FH,000H
                            2214     C
0BCE  00 00 00 00 00 00     2215     C          DB      000H,000H,000H,000H,000H,000H
0BD4  05 0F FF              2216     C          DB      005H,00FH,0FFH
                            2217     C
                            2218     C
= 04C0                      2219     C  BASE_3  EQU     $ - VIDEO_PARMS
                            2220     C
                            2221     C  ;----- HI RES ALTERNATE VALUES
                            2222     C
                            2223     C  ;--0--
0BD7  28 18 0E              2224     C          DB      40D,24D,14D
0BDA  0800                  2225     C          DW      00800H
                            2226     C
0BDC  0B 03 00 03           2227     C          DB      00BH,003H,000H,003H
                            2228     C
0BE0  A7                    2229     C          DB      0A7H
                            2230     C
0BE1  2D 27 2B 2D 28 6D     2231     C          DB      02DH,027H,02BH,02DH,028H,06DH
0BE7  6C 1F 00 0D 06 07     2232     C          DB      06CH,01FH,000H,00DH,006H,007H
0BED  00 00 00 00 5E 2B     2233     C          DB      000H,000H,000H,000H,05EH,02BH
0BF3  5D 14 0F 5E 0A A3     2234     C          DB      05DH,014H,00FH,05EH,00AH,0A3H
0BF9  FF                    2235     C          DB      0FFH
                            2236     C
0BFA  00 01 02 03 04 05     2237     C          DB      000H,001H,002H,003H,004H,005H
0C00  14 07 38 39 3A 3B     2238     C          DB      014H,007H,038H,039H,03AH,03BH
0C06  3C 3D 3E 3F 08 00     2239     C          DB      03CH,03DH,03EH,03FH,008H,000H
0C0C  0F 00                 2240     C          DB      00FH,000H
                            2241     C
0C0E  00 00 00 00 00 10     2242     C          DB      000H,000H,000H,000H,000H,010H
0C14  0E 00 FF              2243     C          DB      00EH,000H,0FFH
                            2244     C
                            2245     C  ;--1--
0C17  28 18 0E              2246     C          DB      40D,24D,14D
0C1A  0800                  2247     C          DW      00800H
                            2248     C
0C1C  0B 03 00 03           2249     C          DB      00BH,003H,000H,003H
                            2250     C
0C20  A7                    2251     C          DB      0A7H
                            2252     C
0C21  2D 27 2B 2D 28 6D     2253     C          DB      02DH,027H,02BH,02DH,028H,06DH
0C27  6C 1F 00 0D 06 07     2254     C          DB      06CH,01FH,000H,00DH,006H,007H
0C2D  00 00 00 00 5E 2B     2255     C          DB      000H,000H,000H,000H,05EH,02BH
0C33  5D 14 0F 5E 0A A3     2256     C          DB      05DH,014H,00FH,05EH,00AH,0A3H
0C39  FF                    2257     C          DB      0FFH
                            2258     C
0C3A  00 01 02 03 04 05     2259     C          DB      000H,001H,002H,003H,004H,005H
0C40  14 07 38 39 3A 3B     2260     C          DB      014H,007H,038H,039H,03AH,03BH
0C46  3C 3D 3E 3F 08 00     2261     C          DB      03CH,03DH,03EH,03FH,008H,000H
0C4C  0F 00                 2262     C          DB      00FH,000H
                            2263     C
0C4E  00 00 00 00 00 10     2264     C          DB      000H,000H,000H,000H,000H,010H
0C54  0E 00 FF              2265     C          DB      00EH,000H,0FFH
                            2266     C
                            2267     C  ;--2--
0C57  50 18 0E              2268     C          DB      80D,24D,14D
```

```
0C5A  1000                    2269     C          DW      01000H
                              2270     C
0C5C  01 03 00 03             2271     C          DB      001H,003H,000H,003H
                              2272     C
0C60  A7                      2273     C          DB      0A7H
                              2274     C
0C61  5B 4F 53 37 51 5B       2275     C          DB      05BH,04FH,053H,037H,051H,05BH
0C67  6C 1F 00 0D 06 07       2276     C          DB      06CH,01FH,000H,00DH,006H,007H
0C6D  00 00 00 00 5E 2B       2277     C          DB      000H,000H,000H,000H,05EH,02BH
0C73  5D 28 0F 5E 0A A3       2278     C          DB      05DH,028H,00FH,05EH,00AH,0A3H
0C79  FF                      2279     C          DB      0FFH
                              2280     C
0C7A  00 01 02 03 04 05       2281     C          DB      000H,001H,002H,003H,004H,005H
0C80  14 07 38 39 3A 3B       2282     C          DB      014H,007H,038H,039H,03AH,03BH
0C86  3C 3D 3E 3F 08 00       2283     C          DB      03CH,03DH,03EH,03FH,008H,000H
0C8C  0F 00                   2284     C          DB      00FH,000H
                              2285     C
0C8E  00 00 00 00 00 10       2286     C          DB      000H,000H,000H,000H,000H,010H
0C94  0E 00 FF                2287     C          DB      00EH,000H,0FFH
                              2288     C
                              2289     C  ;--3--
0C97  50 18 0E                2290     C          DB      80D,24D,14D
0C9A  1000                    2291     C          DW      01000H
                              2292     C
0C9C  01 03 00 03             2293     C          DB      001H,003H,000H,003H
                              2294     C
0CA0  A7                      2295     C          DB      0A7H
                              2296     C
0CA1  5B 4F 53 37 51 5B       2297     C          DB      05BH,04FH,053H,037H,051H,05BH
0CA7  6C 1F 00 0D 06 07       2298     C          DB      06CH,01FH,000H,00DH,006H,007H
0CAD  00 00 00 00 5E 2B       2299     C          DB      000H,000H,000H,000H,05EH,02BH
0CB3  5D 28 0F 5E 0A A3       2300     C          DB      05DH,028H,00FH,05EH,00AH,0A3H
0CB9  FF                      2301     C          DB      0FFH
                              2302     C
0CBA  00 01 02 03 04 05       2303     C          DB      000H,001H,002H,003H,004H,005H
0CC0  14 07 38 39 3A 3B       2304     C          DB      014H,007H,038H,039H,03AH,03BH
0CC6  3C 3D 3E 3F 08 00       2305     C          DB      03CH,03DH,03EH,03FH,008H,000H
0CCC  0F 00                   2306     C          DB      00FH,000H
                              2307     C
0CCE  00 00 00 00 00 10       2308     C          DB      000H,000H,000H,000H,000H,010H
0CD4  0E 00 FF                2309     C          DB      00EH,000H,0FFH
                              2310     C
                              2311     C
                              2312     C          SUBTTL
                              2313
                              2314          ;----- VECTOR INTO <AH> SPECIFIED FUNCTION
                              2315
0CD7                          2316          COMBO_VIDEO     PROC    NEAR
0CD7  FB                      2317                  STI                             ; INTERRUPTS ON
0CD8  FC                      2318                  CLD                             ; SET DIRECTION FORWARD
0CD9  55                      2319                  PUSH    BP                      ; SAVE THE REGISTER SET
0CDA  06                      2320                  PUSH    ES
0CDB  1E                      2321                  PUSH    DS
0CDC  52                      2322                  PUSH    DX
0CDD  51                      2323                  PUSH    CX
0CDE  53                      2324                  PUSH    BX
0CDF  56                      2325                  PUSH    SI
0CE0  57                      2326                  PUSH    DI
                              2327
0CE1  50                      2328                  PUSH    AX                      ; SAVE AX VALUE
0CE2  8A C4                   2329                  MOV     AL,AH                   ; GET INTO LOW BYTE
0CE4  32 E4                   2330                  XOR     AH,AH                   ; ZERO TO HIGH BYTE
0CE6  D1 E0                   2331                  SAL     AX,1                    ; * 2 FOR TABLE LOOKUP
0CE8  8B F0                   2332                  MOV     SI,AX                   ; PUT INTO SI FOR BRANCH
0CEA  3D 0028                 2333                  CMP     AX,T2L                  ; TEST FOR WITHIN RANGE
0CED  72 06                   2334                  JB      M2                      ; BRANCH AROUND BRANCH
0CEF  58                      2335                  POP     AX                      ; RECOVER REGISTER
0CF0  CD 42                   2336                  INT     42H                     ; PASS UNRECOGNIZED CALL
0CF2  E9 219E R               2337                  JMP     V_RET                   ; RETURN TO CALLER
0CF5                          2338          M2:
                              2339                  ASSUME  DS:ABS0
0CF5  E8 0CFE R               2340                  CALL    DDS
0CF8  58                      2341                  POP     AX                      ; RECOVER
0CF9  2E: FF A4 06EF R        2342                  JMP     WORD PTR CS:[SI + OFFSET T2]    ; JMP TO AH=0 THRU AH=XX
                              2343
                              2344          ;----- UTILITY ROUTINES
                              2345
                              2346          ;----- SET DS TO THE DATA SEGMENT
                              2347
0CFE                          2348          DDS     PROC    NEAR
0CFE  50                      2349                  PUSH    AX                      ; SAVE REGISTER
0CFF  2B C0                   2350                  SUB     AX,AX
0D01  8E D8                   2351                  MOV     DS,AX
0D03  58                      2352                  POP     AX                      ; RESTORE REGISTER
0D04  C3                      2353                  RET
0D05                          2354          DDS     ENDP
                              2355
0D05                          2356          WHAT_BASE       PROC    NEAR
                              2357                  ASSUME  DS:ABS0
0D05  1E                      2358                  PUSH    DS                      ; SAVE DATA SEGMENT
0D06  E8 0CFE R               2359                  CALL    DDS                     ; GET LOW MEMORY SEGMENT
0D09  8B 16 0463 R            2360                  MOV     DX,ADDR_6845            ; GET CRTC ADDRESS
0D0D  80 E2 F0                2361                  AND     DL,0F0H                 ; STRIP OFF LOW NIBBLE
0D10  80 CA 0A                2362                  OR      DL,0AH                  ; SET TO STATUS REGISTER
0D13  1F                      2363                  POP     DS
0D14  C3                      2364                  RET
0D15                          2365          WHAT_BASE       ENDP
                              2366
0D15                          2367          OUT_DX  PROC    NEAR                    ; AH=INDEX,AL=DATA,DX=PORT
0D15  86 C4                   2368                  XCHG    AL,AH                   ; GET INDEX VALUE
0D17  EE                      2369                  OUT     DX,AL                   ; SET INDEX REG
0D18  42                      2370                  INC     DX                      ; SET DX TO DATA REG
0D19  86 C4                   2371                  XCHG    AL,AH                   ; GET DATA VALUE
0D1B  EE                      2372                  OUT     DX,AL                   ; SET DATA REG
0D1C  4A                      2373                  DEC     DX                      ; SET DX BACK TO INDEX
0D1D  C3                      2374                  RET
0D1E                          2375          OUT_DX  ENDP
                              2376
                              2377          ;----- ROUTINE TO SOUND BEEPER
                              2378
0D1E                          2379          BP_1    PROC    NEAR
0D1E  EE                      2380                  OUT     DX,AL
0D1F  C3                      2381                  RET
0D20                          2382          BP_1    ENDP
                              2383
0D20                          2384          BEEP    PROC    NEAR
0D20  52                      2385                  PUSH    DX
0D21  BA 0043                 2386                  MOV     DX,TIMER+3
0D24  B0 B6                   2387                  MOV     AL,10110110B            ; SEL TIM 2,LSB,MSB,BINARY
0D26  E8 0D1E R               2388                  CALL    BP_1                    ; WRITE THE TIMER MODE REG
0D29  B8 0533                 2389                  MOV     AX,533H                 ; DIVISOR FOR 1000 HZ
0D2C  4A                      2390                  DEC     DX
0D2D  E8 0D1E R               2391                  CALL    BP_1                    ; WRITE TIMER 2 CNT - LSB
0D30  8A C4                   2392                  MOV     AL,AH
0D32  E8 0D1E R               2393                  CALL    BP_1                    ; WRITE TIMER 2 CNT - MSB
0D35  BA 0061                 2394                  MOV     DX,PORT_B
```

```
0D38  EC                      2395                IN      AL,DX                           ; GET SETTING OF PORT
0D39  8A E0                   2396                MOV     AH,AL                           ; SAVE THAT SETTING
0D3B  0C 03                   2397                OR      AL,03                           ; TURN SPEAKER ON
0D3D  E8 0D1E R               2398                CALL    BP_1
0D40  2B C9                   2399                SUB     CX,CX                           ; SET CNT TO WAIT 500 MS
0D42                          2400        G7:
0D42  E2 FE                   2401                LOOP    G7                              ; DELAY BEFORE TURNING OFF
0D44  FE CB                   2402                DEC     BL                              ; DELAY CNT EXPIRED?
0D46  75 FA                   2403                JNZ     G7                              ; NO-CONTINUE BEEPING SPK
0D48  8A C4                   2404                MOV     AL,AH                           ; RECOVER VALUE OF PORT
0D4A  E8 0D1E R               2405                CALL    BP_1
0D4D  5A                      2406                POP     DX
0D4E  C3                      2407                RET                                     ; RETURN TO CALLER
0D4F                          2408        BEEP    ENDP
                              2409
                              2410        ;----- FIND THE PARAMETER TABLE VECTOR IN THE SAVE TABLE
                              2411
0D4F                          2412        SET_BASE        PROC    NEAR
                              2413                ASSUME  DS:ABS0
0D4F  E8 0CFE R               2414                CALL    DDS
0D52  C4 1E 04A8 R            2415                LES     BX,SAVE_PTR                     ; GET PTR TP PTR TABLE
0D56  26: C4 1F               2416                LES     BX,DWORD PTR ES:[BX]            ; GET PARAMETER PTR
0D59  C3                      2417                RET
0D5A                          2418        SET_BASE        ENDP
                              2419
                              2420        ;----- ESTABLISH ADDRESSING TO THE CORRECT MODE TABLE ENTRY
                              2421
0D5A                          2422        MAKE_BASE       PROC    NEAR
                              2423                ASSUME  DS:ABS0
0D5A  51                      2424                PUSH    CX
0D5B  52                      2425                PUSH    DX
0D5C  E8 0D4F R               2426                CALL    SET_BASE                        ; GET PARM TBL PTR
0D5F  8A 26 0449 R            2427                MOV     AH,CRT_MODE
0D63  F6 06 0487 R 60         2428                TEST    INFO,060H                       ; TEST FOR BASE CARD
0D68  74 18                   2429                JZ      B_M_1                           ; MIN MEMORY
                              2430
                              2431        ;----- WE HAVE A MEMORY EXPANSION OPTION HERE
                              2432
0D6A  80 FC 0F                2433                CMP     AH,0FH
0D6D  75 07                   2434                JNE     B_M_2
0D6F  81 C3 0440              2435                ADD     BX,BASE_2 - BASE_1
0D73  EB 33 90                2436                JMP     B_M_OUT
0D76                          2437        B_M_2:
0D76  80 FC 10                2438                CMP     AH,010H
0D79  75 07                   2439                JNE     B_M_1
0D7B  81 C3 0480              2440                ADD     BX,BASE_2 + M_TBL_LEN - BASE_1
0D7F  EB 27 90                2441                JMP     B_M_OUT
0D82                          2442        B_M_1:
0D82  80 FC 03                2443                CMP     AH,03H
0D85  77 14                   2444                JA      B_M_3                           ; SKIP ENHANCED PORTION
                              2445
                              2446        ;----- CHECK THE SWITCH SETTING FOR ENHANCEMENT
                              2447
0D87  A0 0488 R               2448                MOV     AL,INFO_3
0D8A  24 0F                   2449                AND     AL,0FH
0D8C  3C 03                   2450                CMP     AL,03H                          ; SECONDARY EMULATE SETTING
0D8E  74 07                   2451                JE      BRS
0D90  3C 09                   2452                CMP     AL,09H                          ; PRIMARY EMULATE SETTING
0D92  74 03                   2453                JE      BRS
0D94  EB 05 90                2454                JMP     B_M_3
                              2455
                              2456        ;----- WE WILL PERFORM ENHANCEMENT
                              2457
0D97                          2458        BRS:
0D97  81 C3 04C0              2459                ADD     BX,BASE_3 - BASE_1              ; VECTOR TO ENHANCEMENT TBL
0D9B                          2460        B_M_3:
0D9B  8A 0E 0449 R            2461                MOV     CL,CRT_MODE
0D9F  2A ED                   2462                SUB     CH,CH
0DA1  E3 05                   2463                JCXZ    B_M_4
                              2464
                              2465        ;----- THIS LOOP WILL MOVE THE PTR TO THE INDIVIDUAL MODE ENTRY
                              2466
0DA3                          2467        B_M_5:
0DA3  83 C3 40                2468                ADD     BX,M_TBL_LEN                    ; LENGTH OF ONE MODE ENTRY
0DA6  E2 FB                   2469                LOOP    B_M_5
0DA8                          2470        B_M_4:
0DA8                          2471        B_M_OUT:
0DA8  5A                      2472                POP     DX
0DA9  59                      2473                POP     CX
0DAA  C3                      2474                RET
0DAB                          2475        MAKE_BASE       ENDP
                              2476
                              2477        ;----- PROGRAM THE EGA REGISTERS FROM THE PARAMETER TABLE
                              2478
0DAB                          2479        SET_REGS        PROC    NEAR
                              2480                ASSUME  DS:ABS0,ES:NOTHING
                              2481
                              2482        ;----- PROGRAM THE SEQUENCER
                              2483
0DAB  E8 0D5A R               2484                CALL    MAKE_BASE                       ; GET TABLE PTR
0DAE  83 C3 05                2485                ADD     BX,TFS_LEN                      ; MODE TO SEQUENCER PARMS
0DB1  B6 03                   2486                MOV     DH,3
0DB3  B2 C4                   2487                MOV     DL,SEQ_ADDR
0DB5  B8 0001                 2488                MOV     AX,0001H                        ; RESET SEQUENCER
0DB8  FA                      2489                CLI                                     ; DISABLE INTERRUPTS
0DB9  E8 0D15 R               2490                CALL    OUT_DX
0DBC  26: 8A 07               2491                MOV     AL,ES:[BX]                      ; GET SEQUENCER VALUE
0DBF  FE C4                   2492                INC     AH                              ; NEXT INDEX
0DC1  E8 0D15 R               2493                CALL    OUT_DX                          ; SET IT
0DC4                          2494        D1:
0DC4  FE C4                   2495                INC     AH                              ; NEXT INDEX REGISTER
0DC6  43                      2496                INC     BX                              ; NEXT TABLE ENTRY
0DC7  26: 8A 07               2497                MOV     AL,ES:[BX]
0DCA  E8 0D15 R               2498                CALL    OUT_DX
0DCD  80 FC 05                2499                CMP     AH,M1+1
0DD0  72 F2                   2500                JB      D1
                              2501
0DD2  26: 8A 07               2502                MOV     AL,ES:[BX]
0DD5  43                      2503                INC     BX
0DD6  B2 C2                   2504                MOV     DL,MISC_OUTPUT
0DD8  EE                      2505                OUT     DX,AL
0DD9  B2 C4                   2506                MOV     DL,SEQ_ADDR
0DDB  B8 0003                 2507                MOV     AX,0003H
0DDE  E8 0D15 R               2508                CALL    OUT_DX                          ; START SEQUENCER
0DE1  FB                      2509                STI                                     ; ENABLE INTERRUPTS
                              2510
                              2511        ;----- PROGRAM THE CRT CONTROLLER
                              2512
0DE2  8B 16 0463 R            2513                MOV     DX,ADDR_6845                    ; CRTC INDEX REGISTER
0DE6  2A E4                   2514                SUB     AH,AH                           ; COUNTER
0DE8                          2515        X1:
0DE8  26: 8A 07               2516                MOV     AL,ES:[BX]                      ; GET VALUE FROM TABLE
0DEB  E8 0D15 R               2517                CALL    OUT_DX                          ; SET CRTC REGISTER
0DEE  43                      2518                INC     BX                              ; NEXT TABLE ENTRY
0DEF  FE C4                   2519                INC     AH                              ; NEXT INDEX VALUE
0DF1  80 FC 19                2520                CMP     AH,M4                           ; TEST REGISTER COUNT
```

```
0DF4  72 F2                    2521                JB      X1                              ; DO THE REST
0DF6  26: 8B 47 F1             2522                MOV     AX,ES:[BX]-[0FH]                ; GET CURSOR MODE
0DFA  86 E0                    2523                XCHG    AH,AL
0DFC  A3 0460 R                2524                MOV     CURSOR_MODE,AX                  ; SET LOW RAM VALUE
                               2525
                               2526        ;----- PROGRAM THE ATTRIBUTE CHIP
                               2527
0DFF  8B F3                    2528                MOV     SI,BX
0E01  E8 0D05 R                2529                CALL    WHAT_BASE
0E04  EC                       2530                IN      AL,DX
0E05  B2 C0                    2531                MOV     DL,ATTR_WRITE
0E07  2A E4                    2532                SUB     AH,AH                           ; INDEX COUNTER
0E09                           2533        D3:
0E09  26: 8A 07                2534                MOV     AL,ES:[BX]                      ; GET DATA VALUE
0E0C  86 E0                    2535                XCHG    AH,AL
0E0E  EE                       2536                OUT     DX,AL
0E0F  86 E0                    2537                XCHG    AH,AL
0E11  EE                       2538                OUT     DX,AL
0E12  43                       2539                INC     BX                              ; NEXT DATA VALUE
0E13  FE C4                    2540                INC     AH                              ; NEXT INDEX VALUE
0E15  80 FC 14                 2541                CMP     AH,M5                           ; TEST REGISTER COUNT
0E18  72 EF                    2542                JB      D3                              ; DO THE REST
                               2543
0E1A  B0 00                    2544                MOV     AL,0
0E1C  EE                       2545                OUT     DX,AL
                               2546
                               2547        ;----- CHECK IF PALETTE REGISTER VALUES ARE TO BE SAVED
                               2548
0E1D  1E                       2549                PUSH    DS
0E1E  06                       2550                PUSH    ES
0E1F  C4 3E 04A8 R             2551                LES     DI,SAVE_PTR                     ; GET TABLE PTR
0E23  26: C4 7D 04             2552                LES     DI,DWORD PTR ES:[DI][4]         ; GET PALETTE PTR
0E27  8C C0                    2553                MOV     AX,ES
0E29  0B C7                    2554                OR      AX,DI
0E2B  74 09                    2555                JZ      SAVE_OUT                        ; IF ZERO, NO SAVE OCCURS
                               2556
                               2557        ;----- STORE AWAY THE PALETTE VALUES IN RAM SAVE AREA
                               2558
0E2D  1F                       2559                POP     DS
0E2E  1E                       2560                PUSH    DS
0E2F  B9 0010                  2561                MOV     CX,16D
0E32  F3/ A4                   2562        REP     MOVSB                                   ; SAVE THE PALETTE REGS
0E34  46                       2563                INC     SI
0E35  A4                       2564                MOVSB                                   ; SAVE THE OVERSCAN REG
0E36                           2565        SAVE_OUT:
0E36  07                       2566                POP     ES
0E37  1F                       2567                POP     DS
                               2568
                               2569        ;----- PROGRAM THE GRAPHICS CHIPS
                               2570
0E38  B2 CC                    2571                MOV     DL,GRAPH_1_POS
0E3A  B0 00                    2572                MOV     AL,0
0E3C  EE                       2573                OUT     DX,AL
0E3D  B2 CA                    2574                MOV     DL,GRAPH_2_POS
0E3F  B0 01                    2575                MOV     AL,1
0E41  EE                       2576                OUT     DX,AL
0E42  B2 CE                    2577                MOV     DL,GRAPH_ADDR
0E44  2A E4                    2578                SUB     AH,AH
0E46                           2579        D4:
0E46  26: 8A 07                2580                MOV     AL,ES:[BX]                      ; PARAMETER BYTE
0E49  E8 0D15 R                2581                CALL    OUT_DX                          ; SET IT
0E4C  43                       2582                INC     BX                              ; NEXT BYTE
0E4D  FE C4                    2583                INC     AH                              ; NEXT REGISTER
0E4F  80 FC 09                 2584                CMP     AH,M6
0E52  72 F2                    2585                JB      D4                              ; CONTINUE
0E54  C3                       2586                RET
0E55                           2587        SET_REGS        ENDP
                               2588
                               2589        ;----- MODE SET REGEN CLEAR ROUTINE
                               2590
0E55                           2591        BLANK   PROC    NEAR                            ; FILL REGEN WITH BLANKS
                               2592                ASSUME  DS:ABS0,ES:NOTHING
0E55  A0 0487 R                2593                MOV     AL,INFO                         ; SEE IF-BLANK IS TO OCCUR
0E58  A8 80                    2594                TEST    AL,080H                         ; MODE SET. HIGH BIT
0E5A  75 39                    2595                JNZ     OUT_1                           ; SKIP BLANK FOR REGEN,
0E5C  BA B800                  2596                MOV     DX,0B800H                       ; COLOR MODE REGEN ADDRESS
0E5F  A0 0449 R                2597                MOV     AL,CRT_MODE                     ; CURRENT MODE SET
0E62  3C 06                    2598                CMP     AL,6                            ; 0-6 ARE COLOR MODES
0E64  76 0A                    2599                JBE     CG0
0E66  BA B000                  2600                MOV     DX,0B000H                       ; MONOCHROME REGEN ADDRESS
0E69  3C 07                    2601                CMP     AL,7                            ; MONOCHROME MODE
0E6B  74 03                    2602                JE      CG0
0E6D  BA A000                  2603                MOV     DX,0A000H                       ; REMAINING MODES
0E70                           2604        CG0:
0E70  BB 0720                  2605                MOV     BX,0720H                        ; ALPHA. BLANK. VALUE
0E73  3C 04                    2606                CMP     AL,4                            ; ALPHAMODES 0-3
0E75  72 06                    2607                JB      WW1
0E77  3C 07                    2608                CMP     AL,7                            ; ALPHA MODE
0E79  74 02                    2609                JE      WW1
0E7B  2B DB                    2610                SUB     BX,BX                           ; GRAPHICS BLANK VALUE
0E7D                           2611        WW1:
                               2612                SRLOAD  ES                              ; SET THE REGEN SEGMENT
0E7D  8E C2                    2613      +          MOV     ES,DX
0E7F  8B 0E 044C R             2614                MOV     CX,CRT_LEN
0E83  E3 10                    2615                JCXZ    OUT_1
0E85  B9 8000                  2616                MOV     CX,08000H
0E88  80 FE A0                 2617                CMP     DH,0A0H
0E8B  74 02                    2618                JE      N_BA
0E8D  B5 40                    2619                MOV     CH,040H
0E8F                           2620        N_BA:
0E8F  8B C3                    2621                MOV     AX,BX                           ; BLANK VACHE
0E91  2B FF                    2622                SUB     DI,DI                           ; CLEAR POINTER
0E93  F3/ AB                   2623                REP     STOSW                           ; CLEAR THE PAGE
0E95                           2624        OUT_1:
0E95  C3                       2625                RET                                     ; RETURN TO CALLER
0E96                           2626        BLANK   ENDP
                               2627
0E96                           2628        PH_5    PROC    NEAR
0E96  E8 1DB7 R                2629                CALL    PAL_ON
0E99  C3                       2630                RET
0E9A                           2631        PH_5    ENDP
                               2632
                               2633        ;----- SEE IF WE ARE TO SUPPORT 640 X 350 ON A 640 X 200 MODE
                               2634
0E9A                           2635        BRST_DET        PROC   NEAR
                               2636                ASSUME  DS:ABS0
0E9A  50                       2637                PUSH    AX
0E9B  1E                       2638                PUSH    DS
0E9C  E8 0CFE R                2639                CALL    DDS
0E9F  A0 0488 R                2640                MOV     AL,INFO_3
0EA2  1F                       2641                POP     DS
0EA3  24 0F                    2642                AND     AL,0FH
0EA5  3C 03                    2643                CMP     AL,03H                          ; EMULATE MODE
0EA7  74 07                    2644                JE      B_YES
0EA9  3C 09                    2645                CMP     AL,09H                          ; EMULATE MODE
0EAB  74 03                    2646                JE      B_YES
```

```
0EAD  58                        2647                POP     AX
0EAE  F8                        2648                CLC
0EAF  C3                        2649                RET
0EB0                            2650        B_YES:
0EB0  58                        2651                POP     AX
0EB1  F9                        2652                STC
0EB2  C3                        2653                RET
0EB3                            2654        BRST_DET        ENDP
                                2655
                                2656        ;----- MODE SET
                                2657
0EB3                            2658        AH0:
                                2659                ASSUME DS:ABS0
0EB3  FA                        2660                CLI
0EB4  C7 06 010C R 0000 E       2661                MOV     WORD PTR GRX_SET,OFFSET CGDDOT
0EBA  8C 0E 010E R              2662                MOV     WORD PTR GRX_SET + 2,CS
0EBE  FB                        2663                STI
0EBF  80 26 0487 R F3           2664                AND     INFO,11110011B                  ; TURN OFF RETRACE BIT
                                2665                                                        ;  EGA ACTIVE BIT
0EC4  50                        2666                PUSH    AX                              ; SAVE
0EC5  F6 06 0487 R 02           2667                TEST    INFO,2
0ECA  74 2C                     2668                JZ      ST_1                            ; THERE IS NO MONOCHROME
0ECC  A1 0410 R                 2669                MOV     AX,EQUIP_FLAG                   ; THERE IS A MONOCHROME
0ECF  24 30                     2670                AND     AL,030H                         ; CHECK THE EQUIPMENT FLAG
0ED1  3C 30                     2671                CMP     AL,030H                         ; FOR MONOCHROME CALL
0ED3  74 48                     2672                JE      ST_2                            ; IT IS A MONOCHROME CALL
                                2673
                                2674        ;----- FALL THROUGH => REGULAR COLOR CARD SETUP
                                2675
0ED5  C6 06 0484 R 18           2676                MOV     ROWS,024D
0EDA  C7 06 0485 R 0008         2677                MOV     POINTS,8
0EE0  58                        2678                POP     AX                              ; RECOVER
0EE1  80 0E 0487 R 08           2679                OR      INFO,00001000B                  ; EGA NOT ACTIVE
0EE6  3C 01                     2680                CMP     AL,1
0EE8  76 09                     2681                JBE     ST_7                            ; WAIT FOR RETRACE ON
0EEA  3C 04                     2682                CMP     AL,4                            ; MODES 2,3 ONLY
0EEC  73 05                     2683                JAE     ST_7
0EEE  80 0E 0487 R 04           2684                OR      INFO,00000100B                  ; DO RETRACE
0EF3                            2685        ST_7:
0EF3  CD 42                     2686                INT     42H                             ; OTHER ADAPTER MODE CALL
0EF5  E9 219E R                 2687                JMP     V_RET                           ; BACK TO CALLER
                                2688
                                2689        ;----- AT THIS POINT THERE IS NO MONOCHROME ATTACHED TO THE ADAPTER
                                2690
0EF8                            2691        ST_1:
0EF8  A1 0410 R                 2692                MOV     AX,EQUIP_FLAG                   ; TEST THE EQUIPMENT FLAG
0EFB  24 30                     2693                AND     AL,030H                         ;  TO SEE IF THIS ISA
0EFD  3C 30                     2694                CMP     AL,030H                         ;  MONOCHROME SETUP CALL
0EFF  75 40                     2695                JNE     ST_3                            ; MUST BE COLOR TO CARD
                                2696
                                2697        ;----- FALL THROUGH => REGULAR MONOCHROME CARD SETUP
                                2698
0F01  C6 06 0484 R 18           2699                MOV     ROWS,024D
0F06  C7 06 0485 R 000E         2700                MOV     POINTS,014D
0F0C  58                        2701                POP     AX                              ; RECOVER
0F0D  CD 42                     2702                INT     42H                             ; OTHER ADAPTER MODE CALL
0F0F  C7 06 0460 R 0B0C         2703                MOV     CURSOR_MODE,0B0CH               ; FIX PLANAR VALUE
0F15  80 0E 0487 R 08           2704                OR      INFO,8                          ; THE EGA IS NOT ACTIVE
0F1A  E9 219E R                 2705                JMP     V_RET                           ; BACK TO CALLER
                                2706
                                2707        ;----- MONOCHROME SETUP TO THE ADAPTER
                                2708
0F1D                            2709        ST_2:
0F1D  58                        2710                POP     AX                              ; RECOVER
0F1E  50                        2711                PUSH    AX                              ; SAVE
0F1F  B6 03                     2712                MOV     DH,3
0F21  24 80                     2713                AND     AL,080H                         ; PICK OFF THE CLEAR BIT
0F23  80 26 0487 R 7F           2714                AND     INFO,07FH                       ; MASK OFF THE OTHER BITS
0F28  08 06 0487 R              2715                OR      INFO,AL                         ; SAVE REGEN CLEAR BIT
0F2C  58                        2716                POP     AX                              ; RECOVER TRUE CALL VALUE
0F2D  24 7F                     2717                AND     AL,07FH                         ; ALREADY DEALT WITH 07
0F2F  3C 0F                     2718                CMP     AL,0FH                          ; A MONOCHROME MODE
0F31  74 02                     2719                JE      ST_2A                           ; DO THIS MODE
0F33  B0 07                     2720                MOV     AL,7                            ; REGULAR MONOCHROME
0F35                            2721        ST_2A:
0F35  A2 0449 R                 2722                MOV     CRT_MODE,AL                     ; SAVE MODE VALUE
0F38  B2 B4                     2723                MOV     DL,CRTC_ADDR_B                  ; IT IS 3-B-X
0F3A  89 16 0463 R              2724                MOV     ADDR_6845,DX                    ; SAVE CRTC ADDRESS
0F3E  EB 1C 90                  2725                JMP     QQ                              ; CONTINUE THE MODE SET
                                2726
                                2727        ;----- COLOR SETUP TO THE ADAPTER
                                2728
0F41                            2729        ST_3:
0F41  58                        2730                POP     AX                              ; RECOVER PARAMETER VALUE
0F42  50                        2731                PUSH    AX                              ; SAVE IT
0F43  B6 03                     2732                MOV     DH,3
0F45  24 80                     2733                AND     AL,080H                         ; ISOLATE REGEN CLEAR BIT
0F47  80 26 0487 R 7F           2734                AND     INFO,07FH                       ; PREPARE INFO BYTE
0F4C  08 06 0487 R              2735                OR      INFO,AL                         ; SET IT; OR NOT
0F50  58                        2736                POP     AX                              ; RECOVER TRUE MODE CALL
0F51  24 7F                     2737                AND     AL,07FH                         ; DONE WITH D7
0F53  A2 0449 R                 2738                MOV     CRT_MODE,AL                     ; SAVE THIS MODE
0F56  B2 D4                     2739                MOV     DL,CRTC_ADDR                    ; 3-D-X
0F58  89 16 0463 R              2740                MOV     ADDR_6845,DX                    ; SAVE CRTC ADDRESS
0F5C                            2741        QQ:
0F5C  C7 06 044E R 0000         2742                MOV     CRT_START,0                     ; SAVE START ADDRESS
0F62  C6 06 0462 R 00           2743                MOV     ACTIVE_PAGE,0                   ; RESET PAGE VALUE TO ZERO
                                2744                ASSUME  ES:NOTHING
0F67  B9 0008                   2745                MOV     CX,8                            ; 8 PAGES OF CURSOR VALUES
0F6A  BF 0450 R                 2746                MOV     DI,OFFSET CURSOR_POSN           ; OFFSET
0F6D  1E                        2747                PUSH    DS                              ; ESTABLISH
0F6E  07                        2748                POP     ES                              ;  ADDRESSING
0F6F  2B C0                     2749                SUB     AX,AX                           ; 0 THOSE CURSOR LOCATIONS
0F71  F3/ AB                    2750                REP     STOSW                           ; CLEAR OUT SAVED VALUES
                                2751
0F73  E8 0D5A R                 2752                CALL    MAKE_BASE
                                2753
0F76  26: 8A 07                 2754                MOV     AL,ES:[BX]                      ; GET COLUMN COUNT
0F79  2A E4                     2755                SUB     AH,AH                           ; ZERO HIGH BYTE
0F7B  A3 044A R                 2756                MOV     CRT_COLS,AX                     ; STORE COLUMN VALUE
                                2757
0F7E  26: 8A 47 01              2758                MOV     AL,ES:[BX][1]                   ; GET ROW VALUE
0F82  A2 0484 R                 2759                MOV     ROWS,AL                         ; STORE ROW VALUE
                                2760
0F85  26: 8A 47 02              2761                MOV     AL,ES:[BX][2]                   ; GET THE BYTES/CHAR
0F89  2A E4                     2762                SUB     AH,AH                           ; ZERO HIGH BYTE
0F8B  A3 0485 R                 2763                MOV     POINTS,AX                       ; STORE BYTES/CHAR
                                2764
0F8E  26: 8B 47 03              2765                MOV     AX,ES:[BX][3]                   ; GET PAGE SIZE
0F92  A3 044C R                 2766                MOV     CRT_LEN,AX                      ; STORE PAGE LENGTH
                                2767
0F95  2B DB                     2768                SUB     BX,BX                           ; ZERO
0F97  B0 01                     2769                MOV     AL,1                            ; MONOCHROME ALPHA GHAR GEN
0F99  8A 26 0449 R              2770                MOV     AH,CRT_MODE                     ; GET CURRENT MODE
0F9D  80 FC 07                  2771                CMP     AH,7                            ; IS IT MONOCHROME
0FA0  74 0C                     2772                JE      ENTRY_2                         ; 9X14 FONT
```

```
0FA2  80 FC 03                2773            CMP     AH,03H
0FA5  77 35                   2774            JA      ENTRY_1
                              2775
0FA7  E8 0E9A R               2776            CALL    BRST_DET
                              2777
0FAA  72 02                   2778            JC      ENTRY_2
0FAC  B0 02                   2779            MOV     AL,2                    ; COLOR ALPHA CHAR GEN
0FAE                          2780    ENTRY_2:
0FAE  E8 1EAE R               2781            CALL    CH_GEN                  ; LOAD ALPHA CHAR GEN
0FB1  E8 0CFE R               2782            CALL    DDS
0FB4  8A 26 0449 R            2783            MOV     AH,CRT_MODE             ; GET CURRENT MODE
0FB8  80 FC 07                2784            CMP     AH,7                    ; IS IT MONOCHROME
0FBB  74 03                   2785            JE      FDG_IT                  ; 9X14 FONT
0FBD  EB 1D 90                2786            JMP     ENTRY_1
0FC0                          2787    FDG_IT:
0FC0  BD 0000 E               2788            MOV     BP,OFFSET CGMN_FDG      ; TABLE POINTER
0FC3  BB 0E00                 2789            MOV     BX,0E00H                ; 14 BYTES PER CHAR
0FC6                          2790    FDG:
0FC6  0E                      2791            PUSH    CS                      ; GET THE ROM SEGMENT
0FC7  07                      2792            POP     ES                      ;  INTO ES
0FC8  26: 8B 56 00            2793            MOV     DX,ES:[BP]              ; GET THE CHAR HEX CODE
0FCC  0B D2                   2794            OR      DX,DX                   ; ZERO = NO MORE CHARS
0FCE  74 0C                   2795            JZ      ENTRY_1                 ; NO MORE
0FD0  B9 0001                 2796            MOV     CX,1                    ; DO ONE CHAR AT A TIME
0FD3  45                      2797            INC     BP                      ; MOVE TO FIRST CODE POINT
0FD4  E8 1EF6 R               2798            CALL    DO_MAP2                 ; STORE THE CODE POINT
0FD7  83 C5 0E                2799            ADD     BP,014D                 ; ADJUST BP TO NEXT CODE
0FDA  EB EA                   2800            JMP     FDG                     ; DO ANOTHER
0FDC                          2801    ENTRY_1:
0FDC  E8 0DAB R               2802            CALL    SET_REGS
0FDF  E8 0E55 R               2803            CALL    BLANK                   ; CLEAR OUT THE BUFFER
0FE2  E8 0E96 R               2804            CALL    PH_5
                              2805
                              2806            ASSUME  DS:ABS0
0FE5  E8 0CFE R               2807            CALL    DDS
0FE8  80 3E 0449 R 0F         2808            CMP     CRT_MODE,0FH
0FED  72 06                   2809            JB      MS_1
0FEF  C7 06 010C R 0000 E     2810            MOV     WORD PTR GRX_SET,OFFSET CGMN
0FF5                          2811    MS_1:
0FF5  80 3E 0449 R 07         2812            CMP     CRT_MODE,7
0FFA  77 09                   2813            JA      SAVE_GRPH
0FFC  74 4B                   2814            JE      SAVE_ALPH
0FFE  80 3E 0449 R 03         2815            CMP     CRT_MODE,3
1003  76 44                   2816            JBE     SAVE_ALPH
1005                          2817    SAVE_GRPH:
1005  C4 1E 04A8 R            2818            LES     BX,SAVE_PTR
1009  83 C3 0C                2819            ADD     BX,0CH
100C  26: C4 1F               2820            LES     BX,DWORD PTR ES:[BX]
100F  8C C0                   2821            MOV     AX,ES
1011  0B C3                   2822            OR      AX,BX
1013  74 32                   2823            JZ      J4J                     ; JMP AHO_DONE
1015  BE 0007                 2824            MOV     SI,07H
1018                          2825    SG_1:
1018  26: 8A 00               2826            MOV     AL,ES:[BX][SI]
101B  3C FF                   2827            CMP     AL,0FFH
101D  74 7A                   2828            JE      AHO_DONE
101F  3A 06 0449 R            2829            CMP     AL,CRT_MODE
1023  74 03                   2830            JE      SG_2
1025  46                      2831            INC     SI
1026  EB F0                   2832            JMP     SG_1
1028                          2833    SG_2:
1028  FA                      2834            CLI
1029  26: 8A 07               2835            MOV     AL,BYTE PTR ES:[BX]
102C  FE C8                   2836            DEC     AL
102E  A2 0484 R               2837            MOV     ROWS,AL
1031  26: 8B 47 01            2838            MOV     AX,WORD PTR ES:[BX][1]
1035  A3 0485 R               2839            MOV     POINTS,AX
1038  26: 8B 47 03            2840            MOV     AX,WORD PTR ES:[BX][3]
103C  A3 010C R               2841            MOV     WORD PTR GRX_SET,AX
103F  26: 8B 47 05            2842            MOV     AX,WORD PTR ES:[BX][5]
1043  A3 010E R               2843            MOV     WORD PTR GRX_SET + 2,AX
1046  FB                      2844            STI
1047                          2845    J4J:
1047  EB 50                   2846            JMP     SHORT AHO_DONE
1049                          2847    SAVE_ALPH:
1049  C4 1E 04A8 R            2848            LES     BX,SAVE_PTR
104D  83 C3 08                2849            ADD     BX,08H
1050  26: C4 1F               2850            LES     BX,DWORD PTR ES:[BX]
1053  8C C0                   2851            MOV     AX,ES
1055  0B C3                   2852            OR      AX,BX
1057  74 40                   2853            JZ      AHO_DONE
1059  BE 000B                 2854            MOV     SI,0BH
105C                          2855    SA_1:
105C  26: 8A 00               2856            MOV     AL,ES:[BX][SI]
105F  3C FF                   2857            CMP     AL,0FFH
1061  74 36                   2858            JE      AHO_DONE
1063  3A 06 0449 R            2859            CMP     AL,CRT_MODE
1067  74 03                   2860            JE      SA_2
1069  46                      2861            INC     SI
106A  EB F0                   2862            JMP     SA_1
106C                          2863    SA_2:
106C  26: 8A 27               2864            MOV     AH,ES:[BX]
106F  26: 8A 47 01            2865            MOV     AL,ES:[BX][1]
1073  26: 8B 4F 02            2866            MOV     CX,ES:[BX][2]
1077  26: 8B 57 04            2867            MOV     DX,ES:[BX][4]
107B  26: 8B 6F 06            2868            MOV     BP,ES:[BX][6]
107F  26: 8E 47 08            2869            MOV     ES,ES:[BX][8]
1083  53                      2870            PUSH    BX
1084  8B D8                   2871            MOV     BX,AX
1086  B8 1110                 2872            MOV     AX,1110H
1089  CD 10                   2873            INT     10H
108B  5B                      2874            POP     BX
108C  26: 8A 47 0A            2875            MOV     AL,ES:[BX][0AH]
1090  3C FF                   2876            CMP     AL,0FFH
1092  74 05                   2877            JE      AHO_DONE
1094  FE C8                   2878            DEC     AL
1096  A2 0484 R               2879            MOV     ROWS,AL
                              2880
                              2881    ;----- SET THE LOW RAM VALUES FOR COMPATIBILITY (3D8 AND 3D9 SAVE BYTES)
                              2882
1099                          2883    AHO_DONE:
1099  E8 0CFE R               2884            CALL    DDS
109C  80 3E 0449 R 07         2885            CMP     CRT_MODE,7
10A1  77 1E                   2886            JA      DNDCS
10A3  BB 10C8 R               2887            MOV     BX,OFFSET COMPAT_MODE
10A6  A0 0449 R               2888            MOV     AL,CRT_MODE
10A9  2A E4                   2889            SUB     AH,AH
10AB  03 D8                   2890            ADD     BX,AX
10AD  2E: 8A 07               2891            MOV     AL,CS:[BX]
10B0  A2 0465 R               2892            MOV     CRT_MODE_SET,AL
10B3  B0 30                   2893            MOV     AL,030H
10B5  80 3E 0449 R 06         2894            CMP     CRT_MODE,6
10BA  75 02                   2895            JNE     DO_PAL
10BC  B0 3F                   2896            MOV     AL,03FH
10BE                          2897    DO_PAL:
10BE  A2 0466 R               2898            MOV     CRT_PALETTE,AL
```

```
10C1                            2899        DNDCS:
10C1  8B 0E 0460 R              2900                MOV     CX,CURSOR_MODE
10C5  EB 28 90                  2901                JMP     AH1
                                2902
10C8                            2903        COMPAT_MODE     LABEL BYTE
10C8  2C 28 2D 29 2A 2E         2904                DB      02CH,028H,02DH,029H,02AH,02EH
10CE  1E 29                     2905                DB      01EH,029H
                                2906
                                2907      C         INCLUDE V1-5.INC
                                2908      C         SUBTTL V1-5.INC
                                2909      C         PAGE
                                2910      C
10D0                            2911      C CALC_CURSOR     PROC    NEAR
                                2912      C         ASSUME  DS:ABS0
10D0  80 FD 00                  2913      C         CMP     CH,0                    ; CHECK FOR FULL HEIGHT
10D3  75 04                     2914      C         JNE     CC_1                    ; NORMAL CHECK
10D5  FE C1                     2915      C         INC     CL                      ; ADJUST END VALUE
10D7  EB 0A                     2916      C         JMP     SHORT CALC_OUT
10D9                            2917      C CC_1:
10D9  FE C1                     2918      C         INC     CL                      ; ADJUST FOR EGA REGISTERS
10DB  3A 0E 0485 R              2919      C         CMP     CL,BYTE PTR POINTS      ; WILL IT WRAP
10DF  72 02                     2920      C         JB      CALC_OUT                ; NO, ITS OK
10E1  2A C9                     2921      C         SUB     CL,CL                   ; EGA METHOD FOR CURSOR END
10E3                            2922      C CALC_OUT:
10E3  51                        2923      C         PUSH    CX                      ; SAVE CURSOR TYPE VALUE
10E4  2A CD                     2924      C         SUB     CL,CH                   ; END - START
10E6  80 F9 10                  2925      C         CMP     CL,010H                 ; LOW NIBBLE EQUAL
10E9  59                        2926      C         POP     CX                      ; RESTORE
10EA  75 02                     2927      C         JNE     COMP_4
10EC  FE C1                     2928      C         INC     CL                      ; ADD 1 FOR CORRECT CURSOR
10EE                            2929      C COMP_4:
10EE  C3                        2930      C         RET                             ; BACK TO CALLER
10EF                            2931      C CALC_CURSOR     ENDP
                                2932      C
                                2933      C ;--------------------------------------------------------------
                                2934      C ; SET_CTYPE     SET CURSOR TYPE                                :
                                2935      C ;       THIS ROUTINE SETS THE CURSOR VALUE                     :
                                2936      C ; INPUT                                                        :
                                2937      C ;       (CX) HAS CURSOR VALUE CH-START LINE, CL-STOP LINE      :
                                2938      C ; OUTPUT                                                       :
                                2939      C ;       NONE                                                   :
                                2940      C ;--------------------------------------------------------------
= 0004                          2941      C         CUT_OFF         EQU     4
10EF                            2942      C AH1:
                                2943      C         ASSUME  DS:ABS0
10EF  B4 0A                     2944      C         MOV     AH,C_CRSR_START         ; CRTC REG FOR CURSOR SET
10F1  89 0E 0460 R              2945      C         MOV     CURSOR_MODE,CX          ; SAVE IN DATA AREA
10F5  F6 06 0487 R 08           2946      C         TEST    INFO,8                  ; EGA ACTIVE BIT
10FA  75 33                     2947      C         JNZ     DO_SET                  ; 0=EGA,1=OLD CARDS
                                2948      C
                                2949      C ;----- THIS SECTION WILL EMULATE CURSOR OFF ON THE EGA
                                2950      C
10FC  8A C5                     2951      C         MOV     AL,CH                   ; GET START VALUE
10FE  24 60                     2952      C         AND     AL,060H                 ; TURN OFF CURSOR ?
1100  3C 20                     2953      C         CMP     AL,020H                 ; TEST THE BITS
1102  75 05                     2954      C         JNE     AH1_A                   ; SKIP CURSOR OFF
1104  B9 1E00                   2955      C         MOV     CX,01E00H               ; EMULATE CURSOR OFF
1107  EB 26                     2956      C         JMP     SHORT DO_SET
                                2957      C
                                2958      C ;----- THIS SECTION : ADJUST THE CURSOR AND TEST FOR ENHANCED OPERATION
                                2959      C
1109                            2960      C AH1_A:
1109  F6 06 0487 R 01           2961      C         TEST    INFO,1                  ; CURSOR EMULATE BIT
110E  75 1F                     2962      C         JNZ     DO_SET                  ; 0=EMULATE,1=VALUE AS-IS
1110  80 3E 0449 R 03           2963      C         CMP     CRT_MODE,3              ; POSSIBLE EMULATION
1115  77 15                     2964      C         JA      AH1_S                   ; NO,SET THE CURSOR TYPE
1117  E8 0E9A R                 2965      C         CALL    BRST_DET                ; SEE IF EMULATE MODE
111A  73 10                     2966      C         JNC     AH1_S                   ; NOT EMULATING
111C  80 FD 04                  2967      C         CMP     CH,CUT_OFF              ; TEST START
111F  76 03                     2968      C         JBE     AH1_B                   ; SKIP ADJUST
1121  80 C5 05                  2969      C         ADD     CH,5                    ; ADJUST
1124                            2970      C AH1_B:
1124  80 F9 04                  2971      C         CMP     CL,CUT_OFF              ; TEST END
1127  76 03                     2972      C         JBE     AH1_S                   ; SKIP ADJUST
1129  80 C1 05                  2973      C         ADD     CL,5
112C                            2974      C AH1_S:
112C  E8 10D0 R                 2975      C         CALL    CALC_CURSOR             ; ADJUST END REGISTER
112F                            2976      C DO_SET:
112F  E8 1135 R                 2977      C         CALL    M16                     ; OUTPUT CX REG
1132  E9 219E R                 2978      C         JMP     V_RET                   ; RETURN TO CALLER
                                2979      C
                                2980      C ;----- THIS ROUTINE OUTPUTS THE CX REGISTER TO THE CRTC REGS NAMED IN AH
                                2981      C
1135                            2982      C M16:
1135  8B 16 0463 R              2983      C         MOV     DX,ADDR_6845            ; ADDRESS REGISTER
1139  8A C5                     2984      C         MOV     AL,CH                   ; DATA
113B  E8 0D15 R                 2985      C         CALL    OUT_DX                  ; OUTPUT THE VALUE
113E  FE C4                     2986      C         INC     AH                      ; NEXT REGISTER
1140  8A C1                     2987      C         MOV     AL,CL                   ; SECOND DATA VALUE
1142  E8 0D15 R                 2988      C         CALL    OUT_DX                  ; OUTPUT THE VALUE
1145  C3                        2989      C         RET                             ; ALL DONE
                                2990      C
                                2991      C ;--------------------------------------------------------------
                                2992      C ; POSITION                                                     :
                                2993      C ;       THIS SERVICE ROUTINE CALCULATES THE REGEN BUFFER        :
                                2994      C ;       ADDRESS OF A CHARACTER IN THE ALPHA MODE                :
                                2995      C ; INPUT                                                        :
                                2996      C ;       AX = ROW,COLUMN POSITION                               :
                                2997      C ; OUTPUT                                                       :
                                2998      C ;       AX = OFFSET OF CHAR POSITION IN REGEN BUFFER            :
                                2999      C ;--------------------------------------------------------------
1146                            3000      C POSITION        PROC    NEAR
1146  53                        3001      C         PUSH    BX                      ; SAVE REGISTER
1147  8B D8                     3002      C         MOV     BX,AX
1149  8A C4                     3003      C         MOV     AL,AH                   ; ROWS TO AL
114B  F6 26 044A R              3004      C         MUL     BYTE PTR CRT_COLS       ; DETERMINE BYTES TO ROW
114F  32 FF                     3005      C         XOR     BH,BH                   ; ZERO OUT
1151  03 C3                     3006      C         ADD     AX,BX                   ; ADD IN COLUMN VALUE
1153  D1 E0                     3007      C         SAL     AX,1                    ; * 2 FOR ATTRIBUTE BYTES
1155  5B                        3008      C         POP     BX                      ; RESTORE REGISTER
1156  C3                        3009      C         RET
1157                            3010      C POSITION        ENDP
                                3011      C
                                3012      C ;--------------------------------------------------------------
                                3013      C ; SET_CPOS      SET CURSOR POSITION                            :
                                3014      C ;       THIS ROUTINE SETS THE CURRENT CURSOR POSITION TO THE   :
                                3015      C ;       NEW X-Y VALUES PASSED                                  :
                                3016      C ; INPUT                                                        :
                                3017      C ;       DX - ROW,COLUMN OF NEW CURSOR                          :
                                3018      C ;       BH - DISPLAY PAGE OF CURSOR                            :
                                3019      C ; OUTPUT                                                       :
                                3020      C ;       CURSOR IS SET AT CRTC 1F DISPLAY PAGE IS CURRENT       :
                                3021      C ;       DISPLAY                                                :
                                3022      C ;--------------------------------------------------------------
1157                            3023      C AH2:
1157  E8 115D R                 3024      C         CALL    SET_CPOS
```

```
115A  E9 219E R           3025     C          JMP     V_RET
                          3026     C
115D                      3027     C  SET_CPOS:
115D  8A CF               3028     C          MOV     CL,BH
115F  32 ED               3029     C          XOR     CH,CH                          ; ESTABLISH LOOP COUNT
1161  D1 E1               3030     C          SAL     CX,1                           ; WORD OFFSET
1163  8B F1               3031     C          MOV     SI,CX                          ; USE INDEX REGISTER
1165  89 94 0450 R        3032     C          MOV     [SI+OFFSET CURSOR_POSN],DX     ; SAVE THE POINTER
1169  38 3E 0462 R        3033     C          CMP     ACTIVE_PAGE,BH
116D  75 05               3034     C          JNZ     M17                            ; SET_CPOS_RETURN
116F  8B C2               3035     C          MOV     AX,DX                          ; GET ROW/COLUMN TO AX
1171  E8 1175 R           3036     C          CALL    M18                            ; CURSOR_SET
1174                      3037     C  M17:                                           ; SET_CPOS_RETURN
1174  C3                  3038     C          RET
                          3039     C
                          3040     C  ;----- SET CURSOR POSITION,AX HAS ROW/COLUMN FOR CURSOR
                          3041     C
1175                      3042     C  M18     PROC    NEAR
1175  E8 1146 R           3043     C          CALL    POSITION                       ; DETERMINE LOC IN REGEN
1178  8B C8               3044     C          MOV     CX,AX
117A  03 0E 044E R        3045     C          ADD     CX,CRT_START                   ; ADD IN THE START ADDR
                          3046     C                                                 ;  FOR THIS PAGE
117E  D1 F9               3047     C          SAR     CX,1                           ; / 2 FOR CHAR ONLY COUNT
1180  B4 0E               3048     C          MOV     AH,C_CRSR_LOC_HGH              ; REGISTER NUMBER FOR CURSOF
1182  E8 1135 R           3049     C          CALL    M16                            ; SET VALUE TO CRTC
1185  C3                  3050     C          RET
1186                      3051     C  M18     ENDP
                          3052     C
                          3053     C  ;--------------------------------------------------------------
                          3054     C  ; READ_CURSOR                                              :
                          3055     C  ;       THIS ROUTINE READS THE CURRENT CURSOR VALUE FROM    :
                          3056     C  ;       MEMORY AND SENDS IT BACK TO THE CALLER              :
                          3057     C  ; INPUT                                                    :
                          3058     C  ;       BH = PAGE OF CURSOR                                 :
                          3059     C  ; OUTPUT                                                   :
                          3060     C  ;       DX = ROW,COLUMN OF THE CURRENT CURSOR POSITION      :
                          3061     C  ;       CX = CURRENT CURSOR MODE                            :
                          3062     C  ;--------------------------------------------------------------
1186                      3063     C  AH3:
1186  8A DF               3064     C          MOV     BL,BH                          ; PAGE VALUE
1188  32 FF               3065     C          XOR     BH,BH                          ; ZERO UPPER BYTE
118A  D1 E3               3066     C          SAL     BX,1                           ; WORD OFFSET
118C  8B 97 0450 R        3067     C          MOV     DX,[BX + OFFSET CURSOR_POSN]   ; GET CURSOR FOR THIS PAGE
1190  8B 0E 0460 R        3068     C          MOV     CX,CURSOR_MODE                 ; GET THE CURSOR MODE
1194  5F                  3069     C          POP     DI
1195  5E                  3070     C          POP     SI
1196  5B                  3071     C          POP     BX
1197  58                  3072     C          POP     AX                             ; DISCARD CX
1198  58                  3073     C          POP     AX                             ; DISCARD DX
1199  1F                  3074     C          POP     DS
119A  07                  3075     C          POP     ES
119B  5D                  3076     C          POP     BP
119C  CF                  3077     C          IRET
                          3078     C
                          3079     C  ;----- READ LIGHT PEN POSITION
                          3080     C
119D                      3081     C  AH4:
119D  A0 0449 R           3082     C          MOV     AL,CRT_MODE
11A0  3C 07               3083     C          CMP     AL,07H
11A2  77 37               3084     C          JA      READ_LPEN
                          3085     C
11A4  F6 06 0487 R 02     3086     C          TEST    INFO,2
11A9  74 07               3087     C          JZ      EGA_IS_COLOR
                          3088     C
                          3089     C  ;----- MONOCHROME HERE (MONOC BIT 1)
                          3090     C
11AB  3C 07               3091     C          CMP     AL,07H
11AD  74 2C               3092     C          JE      READ_LPEN
11AF  EB 05 90            3093     C          JMP     OLD_LP
                          3094     C
                          3095     C  ;----- EGA IS COLOR HERE (MONOC BIT 0)
                          3096     C
11B2                      3097     C  EGA_IS_COLOR:
11B2  3C 06               3098     C          CMP     AL,06H
11B4  76 25               3099     C          JBE     READ_LPEN
11B6                      3100     C  OLD_LP:
11B6  CD 42               3101     C          INT     42H                            ; CALL EXISTING CODE
11B8  5F                  3102     C          POP     DI
11B9  5E                  3103     C          POP     SI
11BA  83 C4 06            3104     C          ADD     SP,6                           ; DISCARD SAVED BX,CX,DX
11BD  1F                  3105     C          POP     DS
11BE  07                  3106     C          POP     ES
11BF  5D                  3107     C          POP     BP
11C0  CF                  3108     C          IRET
                          3109     C
                          3110     C  ;--------------------------------------------------------------
                          3111     C  ; LIGHT PEN                                                :
                          3112     C  ;       THIS ROUTINE TESTS THE LIGHT PEN SWITCH AND THE LIGHT  :
                          3113     C  ;       PEN TRIGGER, IF BOTH ARE SET, THE LOCATION OF THE LIGHT :
                          3114     C  ;       PEN IS DETERMINED, OTHERWISE, A RETURN WITH NO      :
                          3115     C  ;       INFORMATION IS MADE.                                :
                          3116     C  ; ON EXIT                                                  :
                          3117     C  ;       (AH) = 0 IF NO LIGHT PEN INFORMATION IS AVAILABLE  :
                          3118     C  ;                BX,CX,DX ARE DESTROYED                    :
                          3119     C  ;       (AH) = 1 IF LIGHT PEN IS AVAILABLE                 :
                          3120     C  ;                (DH,DL) = ROW,COLUMN OF CURRENT LIGHT PEN :
                          3121     C  ;                          POSITION                        :
                          3122     C  ;                (CH) = RASTER POSITION (OLD MODES)        :
                          3123     C  ;                (BX) = RASTER POSITION (NEW MODES)        :
                          3124     C  ;                (BX) = BEST GUESS AT PIXEL HORIZONTAL POSITION :
                          3125     C  ;--------------------------------------------------------------
                          3126     C          ASSUME  CS:CODE,DS:ABS0
                          3127     C  ;----- SUBTRACT_TABLE
11C1                      3128     C  V1      LABEL   BYTE
11C1  06 06 07 07 05 05   3129     C          DB      006H,006H,007H,007H,005H,005H  ; 0-5
11C7  04 05 00 00 00 00   3130     C          DB      004H,005H,000H,000H,000H,000H  ; 6-B
11CD  00 05 06 04 04 04   3131     C          DB      000H,005H,006H,004H,004H,004H  ; C-11
11D3  04 06 06 04 07 04   3132     C          DB      004H,006H,006H,004H,007H,004H  ; 12-17
11D9  07 04               3133     C          DB      007H,004H                      ; 18-19
                          3134     C
11DB                      3135     C  READ_LPEN       PROC    NEAR
                          3136     C
                          3137     C  ;----- WAIT FOR LIGHT PEN TO BE DEPRESSED
                          3138     C
11DB  8B 16 0463 R        3139     C          MOV     DX,ADDR_6845                   ; GET BASE ADDRESS OF 6845
11DF  83 C2 06            3140     C          ADD     DX,6                           ; POINT TO STATUS REGISTER
11E2  EC                  3141     C          IN      AL,DX                          ; GET STATUS REGISTER
11E3  A8 04               3142     C          TEST    AL,4                           ; TEST LIGHT PEN SWITCH
11E5  B4 00               3143     C          MOV     AH,0                           ; SET NO LIGHT PEN RETURN
11E7  74 03               3144     C          JZ      V9                             ;  CODE
11E9  E9 1291 R           3145     C          JMP     V6                             ; NOT SET, RETURN
                          3146     C
                          3147     C  ;----- NOW TEST FOR LIGHT PEN TRIGGER
                          3148     C
11EC                      3149     C  V9:
11EC  A8 02               3150     C          TEST    AL,2                           ; TEST LIGHT PEN TRIGGER
```

```
11EE  75 03                3151     C          JNZ     V7A                                ; RETURN WITHOUT RESETTING
                           3152     C                                                     ; TRIGGER
11F0  E9 129B R            3153     C          JMP     V7                                 ; EXT LIGHT PEN ROUTINE
                           3154     C
                           3155     C  ;----- TRIGGER HAS BEEN SET,READ THE VALUE IN
                           3156     C
11F3                       3157     C  V7A:
11F3  B4 10                3158     C          MOV     AH,16                              ; LIGHT PEN REGISTERS
                           3159     C
                           3160     C  ;----- INPUT REGS POINTED TO BY AH,AND CONVERT TO ROW COLUMN IN DX
                           3161     C
11F5  8B 16 0463 R         3162     C          MOV     DX,ADDR_6845                       ; ADDRESS REGISTER
11F9  8A C4                3163     C          MOV     AL,AH                              ; REGISTER TO READ
11FB  EE                   3164     C          OUT     DX,AL                              ; SET IT UP
11FC  42                   3165     C          INC     DX                                 ; DATA REGISTER
11FD  50                   3166     C          PUSH    AX
11FE  EC                   3167     C          IN      AL,DX                              ; GET THE VALUE
11FF  8A E8                3168     C          MOV     CH,AL                              ; SAVE IN CX
1201  58                   3169     C          POP     AX
1202  4A                   3170     C          DEC     DX                                 ; ADDRESS REGISTER
1203  FE C4                3171     C          INC     AH
1205  8A C4                3172     C          MOV     AL,AH                              ; SECOND DATA REGISTER
1207  EE                   3173     C          OUT     DX,AL
1208  42                   3174     C          INC     DX                                 ; POINT TO DATA REGISTER
1209  EC                   3175     C          IN      AL,DX                              ; GET THE 2ND DATA VALUE
120A  8A E5                3176     C          MOV     AH,CH                              ; AX HAS INPUT VALUE
                           3177     C
                           3178     C  ;----- AX HAS THE VALUE READ IN FROM THE 6845
                           3179     C
120C  8A 1E 0449 R         3180     C          MOV     BL,CRT_MODE
1210  2A FF                3181     C          SUB     BH,BH                              ; MODE VALUE TO BX
1212  2E: 8A 9F 11C1 R     3182     C          MOV     BL,CS:V1[BX]                       ; AMOUNT TO SUBTRACT
1217  2B C3                3183     C          SUB     AX,BX                              ; TAKE IT AWAY
1219  8B 1E 044E R         3184     C          MOV     BX,CRT_START                       ; SCREEN ADDRESS
121D  D1 EB                3185     C          SHR     BX,1                               ; DIVIDE BY 2
121F  2B C3                3186     C          SUB     AX,BX                              ; ADJUST TO ZERO START
1221  79 02                3187     C          JNS     V2                                 ; IF POSITIVE, GET MODE
1223  2B C0                3188     C          SUB     AX,AX                              ; <0 PLAYS AS 0
                           3189     C
                           3190     C  ;----- DETERMINE MODE OF OPERATION
                           3191     C
1225                       3192     C  V2:                                                ; DETERMINE MODE
1225  B1 03                3193     C          MOV     CL,3                               ; SET *8 SHIFT COUNT
1227  80 3E 0449 R 04      3194     C          CMP     CRT_MODE,4                         ; GRAPHICS OR ALPHA
122C  72 4D                3195     C          JB      V4                                 ; ALPHA_PEN
122E  80 3E 0449 R 07      3196     C          CMP     CRT_MODE,7
1233  74 46                3197     C          JE      V4                                 ; ALPHA_PEN
                           3198     C
1235  80 3E 0449 R 06      3199     C          CMP     CRT_MODE,06H
123A  77 28                3200     C          JA      V8
123C  75 02                3201     C          JNE     V8X
123E  D1 E8                3202     C          SHR     AX,1
                           3203     C
                           3204     C  ;----- OLD GRAPHICS MODES
                           3205     C
1240                       3206     C  V8X:
1240  B2 28                3207     C          MOV     DL,40                              ; DIVISOR FOR GRAPHICS
1242  F6 F2                3208     C          DIV     DL                                 ; ROW(AL) AND COLUMN(AH)
                           3209     C                                                     ; AL RANGE 0-99,
                           3210     C                                                     ; AH RANGE 0-39
                           3211     C  ;----- DETERMINE GRAPHIC ROW POSITION
                           3212     C
1244  8A E8                3213     C          MOV     CH,AL                              ; SAVE ROW VALUE IN CH
1246  02 ED                3214     C          ADD     CH,CH                              ; *2 FOR EVEN/ODD FIELD
1248  8A DC                3215     C          MOV     BL,AH                              ; COLUMN VALUE TO BX
124A  2A FF                3216     C          SUB     BH,BH                              ; *8 FOR MEDIUM RES
124C  80 3E 0449 R 06      3217     C          CMP     CRT_MODE,6                         ; MEDIUM OR HIGH RES
1251  75 04                3218     C          JNE     V3                                 ; NOT_HIGH_RES
1253  B1 04                3219     C          MOV     CL,4                               ; SHIFT VALUE FOR HIGH RES
1255  D0 E4                3220     C          SAL     AH,1                               ; COLUMN VALUE *2 FOR HIGH RES
1257                       3221     C  V3:                                                ; NOT_HIGH_RES
1257  D3 E3                3222     C          SHL     BX,CL                              ; *16 FOR HIGH RES
                           3223     C
                           3224     C  ;----- DETERMINE ALPHA CHAR POSITION
                           3225     C
1259  8A D4                3226     C          MOV     DL,AH                              ; COLUMN VALUE FOR RETURN
125B  8A F0                3227     C          MOV     DH,AL                              ; ROW VALUE
125D  D0 EE                3228     C          SHR     DH,1                               ; DIVIDE BY 4
125F  D0 EE                3229     C          SHR     DH,1                               ; FOR VALUE IN 0-24 RANGE
1261  EB 2C 90             3230     C          JMP     V5                                 ; LIGHT_PEN_RETURN_SET
1264                       3231     C  V8:
                           3232     C
                           3233     C  ;----- NEW GRAPHICS MODES
                           3234     C
1264  99                   3235     C          CWD                                        ; PREPARE TO DIVIDE
1265  F7 36 044A R         3236     C          DIV     CRT_COLS                           ; AX = ROW, DX = GOLUMN
1269  8B DA                3237     C          MOV     BX,DX                              ; SAVE REMAINDER
126B  D3 E3                3238     C          SAL     BX,CL                              ; PEL COLUMN
126D  8B C8                3239     C          MOV     CX,AX                              ; PEL ROW
126F  52                   3240     C          PUSH    DX                                 ; SAVE FROM DIVIDE
1270  99                   3241     C          CWD                                        ; PREPARE TO DIVIDE
1271  F7 36 0485 R         3242     C          DIV     POINTS                             ; BIVIDE BY BYTES/CHAR
1275  5A                   3243     C          POP     DX                                 ; RECOVER
1276  8A F0                3244     C          MOV     DH,AL                              ; GHARACTER ROW
1278  EB 15 90             3245     C          JMP     V5
                           3246     C
                           3247     C  ;----- ALPHA MODE ON LIGHT PEN
                           3248     C
127B                       3249     C  V4:                                                ; ALPHA_PEN
127B  F6 36 044A R         3250     C          DIV     BYTE PTR CRT_COLS                  ; ROW,COLUMN VALUE
127F  8A F0                3251     C          MOV     DH,AL                              ; ROWS TO DH
1281  8A D4                3252     C          MOV     DL,AH                              ; COLS TO DL
1283  8A DC                3253     C          MOV     BL,AH                              ; COLUMN VALUE
1285  32 FF                3254     C          XOR     BH,BH                              ; TO BX
1287  D3 E3                3255     C          SAL     BX,CL
1289  F6 26 0485 R         3256     C          MUL     BYTE PTR POINTS
128D  8B C8                3257     C          MOV     CX,AX
128F                       3258     C  V5:                                                ; LIGHT_PEN_RETURN_SET
128F  B4 01                3259     C          MOV     AH,1                               ; INDICATE EVERTHING SET
1291                       3260     C  V6:                                                ; LIGHT_PEN_RETURN
1291  52                   3261     C          PUSH    DX                                 ; SAVE RETURN VALUE
                           3262     C                                                     ;  (IN CASE)
1292  8B 16 0463 R         3263     C          MOV     DX,ADDR_6845                       ; GET BASE ADDRESS
1296  83 C2 07             3264     C          ADD     DX,7                               ; POINT TO RESET PARM
1299  EE                   3265     C          OUT     DX,AL                              ; ADDRESS, NOT DATA,
                           3266     C                                                     ;  IS IMPORTANT
129A  5A                   3267     C          POP     DX                                 ; RECOVER VALUE
129B                       3268     C  V7:                                                ; RETURN_NO_RESET
129B  5F                   3269     C          POP     DI
129C  5E                   3270     C          POP     SI
129D  83 C4 06             3271     C          ADD     SP,6                               ; DISCARD SAVED BX,CX,DX
12A0  1F                   3272     C          POP     DS
12A1  07                   3273     C          POP     ES
12A2  5D                   3274     C          POP     BP
12A3  CF                   3275     C          IRET
12A4                       3276     C  READ_LPEN       ENDP
```

```
                        3277     C
                        3278     C ;--------------------------------------------------------------------
                        3279     C ; ACT_DISP_PAGE         SELECT ACTIVE DISPLAY PAGE                :
                        3280     C ;       THIS ROUTINE SETS THE ACTIVE DISPLAY PAGE, ALLOWING       :
                        3281     C ;       FOR MULTIPLE PAGES OF DISPLAYED VIDEO.                    :
                        3282     C ; INPUT                                                           :
                        3283     C ;       AL HAS THE NEW ACTIVE DISPLAY PAGE                        :
                        3284     C ; OUTPUT                                                          :
                        3285     C ;       THE CRTC IS RESET TO DISPLAY THAT PAGE                    :
                        3286     C ;--------------------------------------------------------------------
12A4                    3287     C AH5:
12A4  A2 0462 R         3288     C         MOV     ACTIVE_PAGE,AL                  ; SAVE ACTIVE PAGE VALUE
12A7  8B 0E 044C R      3289     C         MOV     CX,CRT_LEN                      ; GET SAVED LENGTH OF
                        3290     C                                                 ;  REGEN BUFFER
12AB  98                3291     C         CBW                                     ; CONVERT AL TO WORD
12AC  50                3292     C         PUSH    AX                              ; SAVE PAGE VALUE
12AD  F7 E1             3293     C         MUL     CX                              ; DISPLAY PAGE TIMES
                        3294     C                                                 ;  REGEN LENGTH
12AF  A3 044E R         3295     C         MOV     CRT_START,AX                    ; SAVE START ADDRESS FOR
                        3296     C                                                 ;  LATER REQUIREMENTS
12B2  8B C8             3297     C         MOV     CX,AX                           ; START ADDRESS TO CX
12B4  8A 1E 0449 R      3298     C         MOV     BL,CRT_MODE
12B8  80 FB 07          3299     C         CMP     BL,7                            ; DO NOT DIVIDE BY TWO
12BB  77 02             3300     C         JA      ADP_1
12BD                    3301     C ADP_2:
12BD  D1 F9             3302     C         SAR     CX,1                            ; / 2 FOR CRTC HANDLING
12BF                    3303     C ADP_1:
12BF  B4 0C             3304     C         MOV     AH,C_STRT_HGH                   ; REG FOR START ADDRESS
12C1  E8 1135 R         3305     C         CALL    M16
12C4  5B                3306     C         POP     BX                              ; RECOVER PAGE VALUE
12C5  D1 E3             3307     C         SAL     BX,1                            ; *2 FOR WORD OFFSET
12C7  8B 87 0450 R      3308     C         MOV     AX,[BX + OFFSET CURSOR_POSN]    ; GET CURSOR FOR THIS PAGE
12CB  E8 1175 R         3309     C         CALL    M18                             ; SET THE CURSOR POSITION
12CE  E9 219E R         3310     C         JMP     V_RET
                        3311     C
                        3312     C         SUBTTL
                        3313
                        3314     C         INCLUDE VSCROLL.INC
                        3315     C         SUBTTL  VSCROLL.INC
                        3316     C         PAGE
                        3317     C
12D1                    3318     C FLTA    PROC    NEAR                            ; CHECK FOR SCROLL COUNT
12D1  50                3319     C         PUSH    AX
12D2  8A E6             3320     C         MOV     AH,DH                           ; LOWER ROW
12D4  2A E5             3321     C         SUB     AH,CH                           ; UPPER ROW
12D6  FE C4             3322     C         INC     AH                              ; NUMBER TO SCROLL
12D8  3A E0             3323     C         CMP     AH,AL                           ; SAME AS REQUESTED
12DA  58                3324     C         POP     AX
12DB  75 02             3325     C         JNE     LTA
12DD  2A C0             3326     C         SUB     AL,AL                           ; YES, SET TO 0 FOR BLANK
12DF                    3327     C LTA:
12DF  C3                3328     C         RET
12E0                    3329     C FLTA    ENDP
                        3330     C
12E0                    3331     C CRANK   PROC    NEAR                            ; MOVE ROWS OF PELS UP
12E0  53                3332     C         PUSH    BX
                        3333     C         ASSUME  DS:ABS0
12E1  1E                3334     C         PUSH    DS                              ; SAVE DATA SEGMENT
12E2  E8 0CFE R         3335     C         CALL    DDS                             ; SET DATA SEGMENT
12E5  8B 1E 044A R      3336     C         MOV     BX,CRT_COLS
12E9  1F                3337     C         POP     DS
12EA                    3338     C CRANK_A:
12EA  51                3339     C         PUSH    CX                              ; SAVE MOVE COUNT
12EB  8A CA             3340     C         MOV     CL,DL                           ; COLUMN COUNT
12ED  2A ED             3341     C         SUB     CH,CH                           ; CLEAR HIGH BYTE
12EF  56                3342     C         PUSH    SI                              ; SAVE POINTERS
12F0  57                3343     C         PUSH    DI
12F1  F3/ A4            3344     C         REP     MOVSB                           ; MOVE THAT ROW
12F3  5F                3345     C         POP     DI                              ; RECOVER POINTERS
12F4  5E                3346     C         POP     SI
12F5  03 F3             3347     C         ADD     SI,BX                           ; NEXT ROW
12F7  03 FB             3348     C         ADD     DI,BX                           ; NEXT ROW
12F9  59                3349     C         POP     CX                              ; RECOVER ROW COUNT
12FA  E2 EE             3350     C         LOOP    CRANK_A                         ; DO MORE
12FC  5B                3351     C         POP     BX
12FD  C3                3352     C         RET                                     ; RETURN TO CALLER
12FE                    3353     C CRANK   ENDP
                        3354     C
12FE                    3355     C CRANK_4 PROC    NEAR                            ; MOVE ROWS OF PELS DOWN
12FE  53                3356     C         PUSH    BX
                        3357     C         ASSUME  DS:ABS0
12FF  1E                3358     C         PUSH    DS                              ; SAVE DATA SEGMENT
1300  E8 0CFE R         3359     C         CALL    DDS                             ; SET DATA SEGMENT
1303  8B 1E 044A R      3360     C         MOV     BX,CRT_COLS
1307  1F                3361     C         POP     DS
1308                    3362     C CRANK_B:
1308  51                3363     C         PUSH    CX                              ; SAVE MOVE COUNT
1309  8A CA             3364     C         MOV     CL,DL                           ; COLUMN COUNT
130B  2A ED             3365     C         SUB     CH,CH                           ; CLEAR HIGH BYTE
130D  56                3366     C         PUSH    SI                              ; SAVE POINTERS
130E  57                3367     C         PUSH    DI
130F  F3/ A4            3368     C         REP     MOVSB                           ; MOVE THAT ROW
1311  5F                3369     C         POP     DI                              ; RECOVER POINTERS
1312  5E                3370     C         POP     SI
1313  2B F3             3371     C         SUB     SI,BX                           ; NEXT ROW
1315  2B FB             3372     C         SUB     DI,BX                           ; NEXT ROW
1317  59                3373     C         POP     CX                              ; RECOVER ROW COUNT
1318  E2 EE             3374     C         LOOP    CRANK_B                         ; DO MORE
131A  5B                3375     C         POP     BX
131B  C3                3376     C         RET                                     ; RETURN TO CALLER
131C                    3377     C CRANK_4 ENDP
                        3378     C
131C                    3379     C PART_1  PROC    NEAR                            ; FILL ROW AFTER SCROLL
131C  52                3380     C         PUSH    DX
131D  B6 03             3381     C         MOV     DH,3
131F  B2 C4             3382     C         MOV     DL,SEQ_ADDR                     ; SEQUENCER
1321  B8 020F           3383     C         MOV     AX,020FH                        ; MAP MASK
1324  E8 0D15 R         3384     C         CALL    OUT_DX                          ; ALL MAPS ON
1327  5A                3385     C         POP     DX
1328  2B C0             3386     C         SUB     AX,AX                           ; ZERO
132A  8A CA             3387     C         MOV     CL,DL                           ; COLUMN COUNT
132C  2A ED             3388     C         SUB     CH,CH
132E  57                3389     C         PUSH    DI                              ; SAVE POINTER
132F  F3/ AA            3390     C         REP     STOSB                           ; CLEAR ONE ROW OF PELS
1331  5F                3391     C         POP     DI                              ; RECOVER POINTER
1332  8A C6             3392     C         MOV     AL,DH                           ; GET COLOR VALUE
1334  52                3393     C         PUSH    DX
1335  B6 03             3394     C         MOV     DH,3
1337  B2 C4             3395     C         MOV     DL,SEQ_ADDR                     ; SEQUENCER
1339  B4 02             3396     C         MOV     AH,02H                          ; MAP MASK
133B  E8 0D15 R         3397     C         CALL    OUT_DX                          ; SET THE COLOR
133E  5A                3398     C         POP     DX
133F  B0 FF             3399     C         MOV     AL,0FFH                         ; ALL BITS ON
1341  8A CA             3400     C         MOV     CL,DL                           ; COLUMN COUNT
1343  57                3401     C         PUSH    DI                              ; SAVE POINTER
1344  F3/ AA            3402     C         REP     STOSB                           ; TURN ON THOSE BITS IN
```

```
                        3403     C                                                      ;  ENABLED PLANES
1346  5F                3404     C          POP     DI                                  ; RECOVER POINTER
1347  C3                3405     C          RET                                         ; RETURN TO CALLER
1348                    3406     C  PART_1  ENDP
                        3407     C
1348                    3408     C  PART_2  PROC    NEAR
1348  B6 03             3409     C          MOV     DH,3
134A  B2 C4             3410     C          MOV     DL,SEQ_ADDR                         ; SEQUENCER
134C  B8 020F           3411     C          MOV     AX,020FH                            ; MAP MASK, ALL MAPS
134F  E8 0D15 R         3412     C          CALL    OUT_DX                              ; ENABLE THE MAPS
1352  C3                3413     C          RET                                         ; RETURN TO CALLER
1353                    3414     C  PART_2  ENDP
                        3415     C
1353                    3416     C  BLNK_3  PROC    NEAR                                ; BLANK FOR SCROLL UP
1353  1E                3417     C          PUSH    DS                                  ; SAVE DATA SEGMENT
                        3418     C          ASSUME  DS:ABS0
1354  E8 0CFE R         3419     C          CALL    DDS                                 ; GET LOW MEMORY SEGMENT
1357  8A F7             3420     C          MOV     DH,BH                               ; ATTRIBUTE FOR BLANK LINE
1359  2A FF             3421     C          SUB     BH,BH                               ; CLEAR HIGH BYTE
135B  50                3422     C          PUSH    AX                                  ; SAVE
135C  52                3423     C          PUSH    DX                                  ; SAVE BECAUSE OF MULTIPLY
135D  8B C3             3424     C          MOV     AX,BX                               ; ROW COUNT
135F  F7 26 0485 R      3425     C          MUL     POINTS                              ; CHARACTER HEIGHT
1363  8B D8             3426     C          MOV     BX,AX                               ; NET VALUE TO BX
1365  5A                3427     C          POP     DX                                  ; RECOVER
1366  58                3428     C          POP     AX
                        3429     C
1367  1F                3430     C          POP     DS
                        3431     C          ASSUME  DS:NOTHING
1368                    3432     C  S13:
1368  E8 131C R         3433     C          CALL    PART_1                              ; BLANK OUT ROW WITH COLOR
                        3434     C          ASSUME  DS:ABS0
136B  1E                3435     C          PUSH    DS                                  ; SAVE SEGMENT
136C  E8 0CFE R         3436     C          CALL    DDS                                 ; LOW MEMORY SEGMENT
136F  03 3E 044A R      3437     C          ADD     DI,CRT_COLS                         ; NEXT ROW
1373  1F                3438     C          POP     DS                                  ; RECOVER
1374  4B                3439     C          DEC     BX                                  ; NEXT
1375  75 F1             3440     C          JNZ     S13                                 ; DO MORE
1377  E8 1348 R         3441     C          CALL    PART_2
137A  C3                3442     C          RET                                         ; RETURN TO CALLER
137B                    3443     C  BLNK_3  ENDP
                        3444     C
137B                    3445     C  BLNK_4  PROC    NEAR                                ; BLANK FOR SCROLL DOWN
137B  1E                3446     C          PUSH    DS                                  ; SAVE DATA SEGMENT
                        3447     C          ASSUME  DS:ABS0
137C  E8 0CFE R         3448     C          CALL    DDS                                 ; GET LOW MEMORY SEGMENT
137F  8A F7             3449     C          MOV     DH,BH                               ; ATTRIBUTE FOR BLANK LINE
1381  2A FF             3450     C          SUB     BH,BH                               ; CLEAR HIGH BYTE
1383  50                3451     C          PUSH    AX                                  ; SAVE
1384  52                3452     C          PUSH    DX                                  ; SAVE BECAUSE OF MULTIPLY
1385  8B C3             3453     C          MOV     AX,BX                               ; ROW COUNT
1387  F7 26 0485 R      3454     C          MUL     POINTS                              ; CHARACTER HEIGHT
138B  8B D8             3455     C          MOV     BX,AX                               ; NET VALUE TO BX
138D  5A                3456     C          POP     DX                                  ; RECOVER
138E  58                3457     C          POP     AX
                        3458     C
138F  1F                3459     C          POP     DS
                        3460     C          ASSUME  DS:NOTHING
1390                    3461     C  S13_4:
1390  E8 131C R         3462     C          CALL    PART_1                              ; BLANK OUT ROW WITH COLOR
                        3463     C          ASSUME  DS:ABS0
1393  1E                3464     C          PUSH    DS                                  ; SAVE SEGMENT
1394  E8 0CFE R         3465     C          CALL    DDS                                 ; LOW MEMORY SEGMENT
1397  2B 3E 044A R      3466     C          SUB     DI,CRT_COLS                         ; NEXT ROW
139B  1F                3467     C          POP     DS                                  ; RECOVER
139C  4B                3468     C          DEC     BX                                  ; NEXT
139D  75 F1             3469     C          JNZ     S13_4                               ; DO MORE
139F  E8 1348 R         3470     C          CALL    PART_2
13A2  C3                3471     C          RET                                         ; RETURN TO CALLER
13A3                    3472     C  BLNK_4  ENDP
                        3473     C
                        3474     C  ;--------------------------------------------------------
                        3475     C  ; SCROLL UP                                            :
                        3476     C  ;       THIS ROUTINE MOVES A BLOCK OF CHARACTERS UP     :
                        3477     C  ;       ON THE SCREEN                                   :
                        3478     C  ; INPUT                                                 :
                        3479     C  ;       (AH) = CURRENT CRT MODE                         :
                        3480     C  ;       (AL) = NUMBER OF ROWS TO SCROLL                 :
                        3481     C  ;       (CX) = ROW/COLUMN OF UPPER LEFT CORNER          :
                        3482     C  ;       (DX) = ROW/COLUMN OF LOWER RIGHT CORNER         :
                        3483     C  ;       (BH) = ATTRIBUTE TO BE USED ON BLANKED LINE     :
                        3484     C  ;       (DS) = DATA SEGMENT                             :
                        3485     C  ;       (ES) = REGEN BUFFER SEGMENT                     :
                        3486     C  ; OUTPUT                                                :
                        3487     C  ;       NONE -- THE REGEN BUFFER IS MODIFIED            :
                        3488     C  ;--------------------------------------------------------
                        3489     C          ASSUME  CS:CODE,DS:ABS0,ES:NOTHING
13A3                    3490     C  SCROLL_UP       PROC    NEAR
13A3  8A D8             3491     C          MOV     BL,AL                               ; SAVE LINE COUNT IN BL
13A5  E8 16EB R         3492     C          CALL    MK_ES
13A8  80 FC 04          3493     C          CMP     AH,4                                ; TEST FOR GRAPHICS MODE
13AB  72 08             3494     C          JB      N1                                  ; HANDLE SEPERATELY
13AD  80 FC 07          3495     C          CMP     AH,7                                ; TEST FOR BW CARD
13B0  74 03             3496     C          JE      N1
13B2  E9 1474 R         3497     C          JMP     GRAPHICS_UP
13B5                    3498     C  N1:                                                 ; UP_CONTINUE
13B5  53                3499     C          PUSH    BX                                  ; SAVE FILL ATTR IN BH
13B6  8B C1             3500     C          MOV     AX,CX                               ; UPPER LEFT POSITION
13B8  E8 13F2 R         3501     C          CALL    SCROLL_POSITION                     ; DO SETUP FOR SCROLL
13BB  74 31             3502     C          JZ      N7                                  ; BLANK_FIELD
13BD  03 F0             3503     C          ADD     SI,AX                               ; FROM ADDRESS
13BF  8A E6             3504     C          MOV     AH,DH                               ; ROWS IN BLOCK
13C1  2A E3             3505     C          SUB     AH,BL                               ; 4 ROWS TO BE MOVED
13C3                    3506     C  N2:                                                 ; ROW_LOOP
13C3  E8 1432 R         3507     C          CALL    N10                                 ; MOVE ONE ROW
13C6  03 F5             3508     C          ADD     SI,BP
13C8  03 FD             3509     C          ADD     DI,BP                               ; NEXT LINE IN BLOCK
13CA  FE CC             3510     C          DEC     AH                                  ; COUNT OF LINES TO MOVE
13CC  75 F5             3511     C          JNZ     N2                                  ; ROW_LOOP
13CE                    3512     C  N3:                                                 ; CLEAR_ENTRY
13CE  58                3513     C          POP     AX                                  ; RECOVER ATTRIBUTE IN AH
13CF  B0 20             3514     C          MOV     AL,' '                              ; FILL WITH BLANKS
13D1                    3515     C  N4:                                                 ; CLEAR_LOOP
13D1  E8 143B R         3516     C          CALL    N11                                 ; CLEAR THE ROW
13D4  03 FD             3517     C          ADD     DI,BP                               ; POINT TO NEXT LINE
13D6  FE CB             3518     C          DEC     BL                                  ; LINES TO SCROLL
13D8  75 F7             3519     C          JNZ     N4                                  ; CLEAR_LOOP
13DA                    3520     C  N5:                                                 ; SCROLL_END
13DA  E8 0CFE R         3521     C          CALL    DDS
13DD  80 3E 0449 R 07   3522     C          CMP     CRT_MODE,7                          ; IS THIS THE B/W CARD
13E2  74 07             3523     C          JE      N6                                  ; SKIP THE MODE RESET
13E4  A0 0465 R         3524     C          MOV     AL,CRT_MODE_SET                     ; GET THE MODE SET
13E7  BA 03D8           3525     C          MOV     DX,03D8H                            ; ALWAYS SET COLOR CARD
13EA  EE                3526     C          OUT     DX,AL
13EB                    3527     C  N6:                                                 ; VIDEO_RET_HERE
13EB  E9 219E R         3528     C          JMP     V_RET
```

```
13EE                    3529     C  N7:                                             ; BLANK_FIELD
13EE  8A DE             3530     C          MOV     BL,DH                         ; GET ROW COUNT
13F0  EB DC             3531     C          JMP     N3                            ; GO CLEAR THAT AREA
13F2                    3532     C  SCROLL_UP       ENDP
                        3533     C
                        3534     C  ;----- HANDLE COMMON SCROLL SET UP HERE
                        3535     C
13F2                    3536     C  SCROLL_POSITION PROC    NEAR
13F2  F6 06 0487 R 04   3537     C          TEST    INFO,4
13F7  74 12             3538     C          JZ      N9
                        3539     C
                        3540     C  ;----- 80X25 COLOR CARD SCROLL
                        3541     C
13F9  52                3542     C          PUSH    DX
13FA  B6 03             3543     C          MOV     DH,3
13FC  B2 DA             3544     C          MOV     DL,0DAH                       ; COLOR CARD HERE
13FE  50                3545     C          PUSH    AX
13FF                    3546     C  N8:                                           ; WAIT_DISP_ENABLE
13FF  EC                3547     C          IN      AL,DX
1400  A8 08             3548     C          TEST AL,8                             ; WAIT FOR VERT RETRACE
1402  74 FB             3549     C          JZ      N8                            ; WAIT_DISP_ENABLE
1404  B0 25             3550     C          MOV     AL,25H
1406  B2 D8             3551     C          MOV     DL,0D8H                       ; DX=3D8
1408  EE                3552     C          OUT     DX,AL                         ; TURN OFF VIDEO
1409  58                3553     C          POP     AX                            ;  DURING VERTICAL RETRACE
140A  5A                3554     C          POP     DX
140B                    3555     C  N9:
140B  E8 1146 R         3556     C          CALL    POSITION                      ; CONVERT TO REGEN POINTER
140E  03 06 044E R      3557     C          ADD     AX,CRT_START                  ; OFFSET OF ACTIVE PAGE
1412  8B F8             3558     C          MOV     DI,AX                         ; TO ADDRESS FOR SCROLL
1414  8B F0             3559     C          MOV     SI,AX                         ; FROM ADDRESS FOR SCROLL
1416  2B D1             3560     C          SUB     DX,CX                         ; DX = #ROWS, #COLS
1418  FE C6             3561     C          INC     DH
141A  FE C2             3562     C          INC     DL                            ; INCREMENT FOR 0 ORIGIN
141C  32 ED             3563     C          XOR     CH,CH                         ; ZERO HIGH BYTE OF COUNT
141E  8B 2E 044A R      3564     C          MOV     BP,CRT_COLS                   ; NUM OF COLS IN DISPLAY
1422  03 ED             3565     C          ADD     BP,BP                         ; TIMES 2 FOR ATTR BYTE
1424  8A C3             3566     C          MOV     AL,BL                         ; GET LINE COUNT
1426  F6 26 044A R      3567     C          MUL     BYTE PTR CRT_COLS             ; OFFSET TO FROM ADDRESS
142A  03 C0             3568     C          ADD     AX,AX                         ; *2 FOR ATTRIBUTE BYTE
142C  06                3569     C          PUSH    ES                            ; ESTABLISH ADDRESSING
142D  1F                3570     C          POP     DS                            ;  FOR BOTH POINTERS
142E  80 FB 00          3571     C          CMP     BL,0                          ; 0 MEANS BLANK FIELD
1431  C3                3572     C          RET                                   ; RETURN WITH FLAGS SET
1432                    3573     C  SCROLL_POSITION ENDP
                        3574     C
                        3575     C  ;----- MOVE_ROW
                        3576     C
1432                    3577     C  N10     PROC    NEAR
1432  8A CA             3578     C          MOV     CL,DL                         ; GET # OF COLS TO MOVE
1434  56                3579     C          PUSH    SI
1435  57                3580     C          PUSH    DI                            ; SAVE START ADDRESS
1436  F3/ A5            3581     C          REP     MOVSW                         ; MOVE THAT LINE ON SCREEN
1438  5F                3582     C          POP     DI
1439  5E                3583     C          POP     SI                            ; RECOVER ADDRESSES
143A  C3                3584     C          RET
143B                    3585     C  N10     ENDP
                        3586     C
                        3587     C  ;----- CLEAR_ROW
                        3588     C
143B                    3589     C  N11     PROC    NEAR
143B  8A CA             3590     C          MOV     CL,DL                         ; GET # COLUMNS TO CLEAR
143D  57                3591     C          PUSH    DI
143E  F3/ AB            3592     C          REP     STOSW                         ; STORE THE FILL CHARACTER
1440  5F                3593     C          POP     DI
1441  C3                3594     C          RET
1442                    3595     C  N11     ENDP
                        3596     C
                        3597     C  ;--------------------------------------------------------
                        3598     C  ; SCROLL_DOWN                                          :
                        3599     C  ;       THIS ROUTINE MOVES THE CHARACTERS WITHIN A     :
                        3600     C  ;       DEFINED BLOCK DOWN ON THE SCREEN, FILLING THE  :
                        3601     C  ;       TOP LINES WITH A DEFINED CHARACTER             :
                        3602     C  ; INPUT                                                :
                        3603     C  ;       (AH) = CURRENT CRT MODE                        :
                        3604     C  ;       (AL) = NUMBER OF LINES TO SCROLL               :
                        3605     C  ;       (CX) = UPPER LEFT CORNER OF REGION             :
                        3606     C  ;       (DX) = LOWER RIGHT CORNER OF REGION            :
                        3607     C  ;       (BH) = FILL CHARACTER                          :
                        3608     C  ;       (DS) = DATA SEGMENT                            :
                        3609     C  ;       (ES) = REGEN SEGMENT                           :
                        3610     C  ; OUTPUT                                               :
                        3611     C  ;       NONE -- SCREEN IS SCROLLED                     :
                        3612     C  ;--------------------------------------------------------
1442                    3613     C  SCROLL_DOWN     PROC    NEAR
1442  FD                3614     C          STD                                   ; SCROLL DOWN
1443  8A D8             3615     C          MOV     BL,AL                         ; LINE COUNT TO BL
1445  E8 16EB R         3616     C          CALL    MK_ES
1448  53                3617     C          PUSH    BX                            ; SAVE ATTRIBUTE IN BH
1449  8B C2             3618     C          MOV     AX,DX                         ; LOWER RIGHT CORNER
144B  E8 13F2 R         3619     C          CALL    SCROLL_POSITION               ; GET REGEN LOCATION
144E  74 20             3620     C          JZ      N16
1450  2B F0             3621     C          SUB     SI,AX                         ; SI IS FROM ADDRESS
1452  8A E6             3622     C          MOV     AH,DH                         ; GET TOTAL ROWS
1454  2A E3             3623     C          SUB     AH,BL                         ; COUNT TO MOVE IN SCROLL
1456                    3624     C  N13:
1456  E8 1432 R         3625     C          CALL    N10                           ; MOVE ONE ROW
1459  2B F5             3626     C          SUB     SI,BP
145B  2B FD             3627     C          SUB     DI,BP
145D  FE CC             3628     C          DEC     AH
145F  75 F5             3629     C          JNZ     N13
1461                    3630     C  N14:
1461  58                3631     C          POP     AX                            ; RECOVER ATTRIBUTE IN AH
1462  B0 20             3632     C          MOV     AL,' '
1464                    3633     C  N15:
1464  E8 143B R         3634     C          CALL    N11                           ; CLEAR ONE ROW
1467  2B FD             3635     C          SUB     DI,BP                         ; GO TO NEXT ROW
1469  FE CB             3636     C          DEC     BL
146B  75 F7             3637     C          JNZ     N15
146D  E9 13DA R         3638     C          JMP     N5                            ; SCROLL_END
1470                    3639     C  N16:
1470  8A DE             3640     C          MOV     BL,DH
1472  EB ED             3641     C          JMP     N14
1474                    3642     C  SCROLL_DOWN     ENDP
                        3643     C
                        3644     C  ;------------------------------------------------------------
                        3645     C  ; SCROLL UP                                              :
                        3646     C  ;       THIS ROUTINE SCROLLS UP THE INFORMATION ON THE CRT :
                        3647     C  ; ENTRY                                                  :
                        3648     C  ;       CH,CL = UPPER LEFT CORNER OF REGION TO SCROLL    :
                        3649     C  ;       DH,DL = LOWER RIGHT CORNER OF REGION TO SCROLL   :
                        3650     C  ;        BOTH OF THE ABOVE ARE IN CHARACTER POSITIONS     :
                        3651     C  ;       BH = FILL VALUE FOR BLANKED LINES                :
                        3652     C  ;       AL = # LINES TO SCROLL (AL=0 MEANS BLANK THE ENTIRE :
                        3653     C  ;            FIELD)                                      :
                        3654     C  ;       DS = DATA SEGMENT                                :
```

```
                        3655     C ;       ES = REGEN SEGMENT                                    :
                        3656     C ; EXIT                                                        :
                        3657     C ;       NOTHING, THE SCREEN IS SCROLLED                       :
                        3658     C ;-------------------------------------------------------------------
1474                    3659     C GRAPHICS_UP   PROC    NEAR
1474  8A D8             3660     C         MOV     BL,AL                         ; SAVE LINE COUNT IN BL
1476  8B C1             3661     C         MOV     AX,CX                         ; GET UPPER LEFT POSITION
                        3662     C                                               ; INTO AX REG
                        3663     C
                        3664     C ;----- USE CHARACTER SUBROUTINE FOR POSITIONING
                        3665     C ;----- ADDRESS RETURNED IS MULTIPLIED BY 2 FROM CORRECT VALUE
                        3666     C
1478  E8 16A7 R         3667     C         CALL    GRAPH_POSN
147B  8B F8             3668     C         MOV     DI,AX                         ; SAVE RESULT AS
                        3669     C                                               ;  DESTINATION ADDRESS
                        3670     C
                        3671     C ;----- DETERMINE SIZE OF WINDOW
                        3672     C
147D  2B D1             3673     C         SUB     DX,CX
147F  81 C2 0101        3674     C         ADD     DX,101H                       ; ADJUST VALUES
1483  D0 E6             3675     C         SAL     DH,1                          ; MULTIPLY ROWS BY 4
                        3676     C                                               ;  SINCE 8 VERT DOTS/CHAR
1485  D0 E6             3677     C         SAL     DH,1                          ;  AND EVEN/ODD ROWS
                        3678     C
                        3679     C ;----- DETERMINE CRT MODE
                        3680     C
1487  80 3E 0449 R 06   3681     C         CMP     CRT_MODE,6                    ; TEST FOR MEDIUM RES
148C  73 04             3682     C         JNC     R7                            ; FIND_SOURCE
                        3683     C
                        3684     C ;----- MEDIUM RES UP
                        3685     C
148E  D0 E2             3686     C         SAL     DL,1                          ; * 2,
1490  D1 E7             3687     C         SAL     DI,1                          ;  SINCE 2 BYTES/CHAR
                        3688     C
                        3689     C ;----- DETERMINE THE SOURCE ADDRESS IN THE BUFFER
                        3690     C
1492                    3691     C R7:                                           ; FIND_SOURCE
1492  06                3692     C         PUSH    ES                            ; GET SEGMENTS BOTH
1493  1F                3693     C         POP     DS                            ;  POINTING TO REGEN
1494  2A ED             3694     C         SUB     CH,CH                         ; 0 TO HIGH OF COUNT REG
1496  D0 E3             3695     C         SAL     BL,1                          ; NUMBER OF LINES *4
1498  D0 E3             3696     C         SAL     BL,1
149A  74 2D             3697     C         JZ      R11                           ; IF 0, BLANK ENTIRE FIELD
149C  8A C3             3698     C         MOV     AL,BL                         ; NUMBER OF LINES IN AL
149E  B4 50             3699     C         MOV     AH,80                         ; 80 BYTES/ROW
14A0  F6 E4             3700     C         MUL     AH                            ; OFFSET TO SOURCE
14A2  8B F7             3701     C         MOV     SI,DI                         ; SET UP SOURCE
14A4  03 F0             3702     C         ADD     SI,AX                         ;  ADD IN OFFSET TO IT
14A6  8A E6             3703     C         MOV     AH,DH                         ; NUMBER OF ROWS IN FIELD
14A8  2A E3             3704     C         SUB     AH,BL                         ; DETERMINE NUMBER TO MOVE
                        3705     C
                        3706     C ;----- LOOP THROUGH, MOVING ONE ROW AT A TIME, BOTH EVEN AND ODD FIELDS
                        3707     C
14AA                    3708     C R8:                                           ; ROW_LOOP
14AA  E8 14CD R         3709     C         CALL    R17                           ; MOVE ONE ROW
14AD  81 EE 1FB0        3710     C         SUB     SI,2000H-80                   ; MOVE TO NEXT ROW
14B1  81 EF 1FB0        3711     C         SUB     DI,2000H-80
14B5  FE CC             3712     C         DEC     AH                            ; NUMBER OF ROWS TO MOVE
14B7  75 F1             3713     C         JNZ     R8                            ; CONTINUE TILL ALL MOVED
                        3714     C
                        3715     C ;----- FILL IN THE VACATED LINE(S)
                        3716     C
14B9                    3717     C R9:                                           ; CLEAR_ENTRY
14B9  8A C7             3718     C         MOV     AL,BH                         ; ATTRIBUTE TO FILL WITH
14BB                    3719     C R10:
14BB  E8 14E6 R         3720     C         CALL    R18                           ; CLEAR THAT ROW
14BE  81 EF 1FB0        3721     C         SUB     DI,2000H-80                   ; POINT TO NEXT LINE
14C2  FE CB             3722     C         DEC     BL                            ; NUMBER OF LINES TO FILL
14C4  75 F5             3723     C         JNZ     R10                           ; CLEAR_LOOP
14C6  E9 219E R         3724     C         JMP     V_RET
14C9                    3725     C R11:                                          ; BLANK_FIELD
14C9  8A DE             3726     C         MOV     BL,DH                         ; SET BLANK COUNT TO
                        3727     C                                               ;  EVERYTHING IN FIELD
14CB  EB EC             3728     C         JMP     R9                            ; CLEAR THE FIELD
14CD                    3729     C GRAPHICS_UP   ENDP
                        3730     C
                        3731     C ;----- ROUTINE TO MOVE ONE ROW OF INFORMATION
                        3732     C
14CD                    3733     C R17     PROC    NEAR
14CD  8A CA             3734     C         MOV     CL,DL                         ; NUM OF BYTES IN THE ROW
14CF  56                3735     C         PUSH    SI
14D0  57                3736     C         PUSH    DI                            ; SAVE POINTERS
14D1  F3/ A4            3737     C         REP     MOVSB                         ; MOVE THE EVEN FIELD
14D3  5F                3738     C         POP     DI
14D4  5E                3739     C         POP     SI
14D5  81 C6 2000        3740     C         ADD     SI,2000H
14D9  81 C7 2000        3741     C         ADD     DI,2000H                      ; POINT TO THE ODD FIELD
14DD  56                3742     C         PUSH    SI
14DE  57                3743     C         PUSH    DI                            ; SAVE THE POINTERS
14DF  8A CA             3744     C         MOV     CL,DL                         ; COUNT BACK
14E1  F3/ A4            3745     C         REP     MOVSB                         ; MOVE THE ODD FIELD
14E3  5F                3746     C         POP     DI
14E4  5E                3747     C         POP     SI                            ; POINTERS BACK
14E5  C3                3748     C         RET                                   ; RETURN TO CALLER
14E6                    3749     C R17     ENDP
                        3750     C
                        3751     C ;----- CLEAR A SINGLE ROW
                        3752     C
14E6                    3753     C R18     PROC    NEAR
14E6  8A CA             3754     C         MOV     CL,DL                         ; NUMBER OF BYTES IN FIELD
14E8  57                3755     C         PUSH    DI                            ; SAVE POINTER
14E9  F3/ AA            3756     C         REP     STOSB                         ; STORE THE NEW VALUE
14EB  5F                3757     C         POP     DI                            ; POINTER BACK
14EC  81 C7 2000        3758     C         ADD     DI,2000H                      ; POINT TO ODD FIELD
14F0  57                3759     C         PUSH    DI
14F1  8A CA             3760     C         MOV     CL,DL
14F3  F3/ AA            3761     C         REP     STOSB                         ; FILL THE ODD FIELD
14F5  5F                3762     C         POP     DI
14F6  C3                3763     C         RET                                   ; RETURN TO CALLER
14F7                    3764     C R18     ENDP
                        3765     C
14F7                    3766     C MEM_DET PROC    NEAR
                        3767     C         ASSUME  DS:ABS0
14F7  50                3768     C         PUSH    AX
14F8  1E                3769     C         PUSH    DS
14F9  E8 0CFE R         3770     C         CALL    DDS
14FC  8A 26 0487 R      3771     C         MOV     AH,INFO
1500  80 E4 60          3772     C         AND     AH,060H
1503  1F                3773     C         POP     DS
1504  58                3774     C         POP     AX
1505  74 02             3775     C         JZ      MIN
1507  F9                3776     C         STC
1508  C3                3777     C         RET
1509                    3778     C MIN:
1509  F8                3779     C         CLC
150A  C3                3780     C         RET
```

```
150B                    3781     C  MEM_DET ENDP
                        3782     C
                        3783     C  ;----- SCROLL ACTIVE PAGE UP
                        3784     C
150B                    3785     C  SC_2:
150B  E9 13A3 R         3786     C          JMP     SCROLL_UP
                        3787     C
150E                    3788     C  AH6:
                        3789     C          ASSUME  DS:ABS0
150E  E8 12D1 R         3790     C          CALL    FLTA
1511  8A 26 0449 R      3791     C          MOV     AH,CRT_MODE                  ; GET CURRENT MODE
1515  80 FC 07          3792     C          CMP     AH,07H
1518  76 F1             3793     C          JBE     SC_2                         ; ANY OF THE OLD MODES
151A  80 FC 0D          3794     C          CMP     AH,0DH
151D  73 17             3795     C          JAE     GRAPHICS_UP_2                ; NEW GRAPHICS MODES
151F  E9 219E R         3796     C          JMP     V_RET                        ; NOT A RECOGNIZED MODE
                        3797     C
1522                    3798     C  GR_ST_1 PROC    NEAR
1522  BA A000           3799     C          MOV     DX,0A000H                    ; REGEN BUFFER
1525  BD 0511           3800     C          MOV     BP,0511H                     ; GRAPHICS WRITE MODE
1528  80 FC 0F          3801     C          CMP     AH,0FH
152B  72 08             3802     C          JB      W1
152D  E8 14F7 R         3803     C          CALL    MEM_DET
1530  73 03             3804     C          JNC     W1
1532  BD 0501           3805     C          MOV     BP,0501H                     ; GRAPHICS WRITE MODE
1535                    3806     C  W1:
1535  C3                3807     C          RET
1536                    3808     C  GR_ST_1 ENDP
                        3809     C
1536                    3810     C  GRAPHICS_UP_2   PROC    NEAR
                        3811     C          ASSUME  DS:ABS0
1536  52                3812     C          PUSH    DX
1537  E8 1522 R         3813     C          CALL    GR_ST_1                      ; SET SEGMENT, WRITE MODE
                        3814     C          SRLOAD  ES                           ; SET REGEN
153A  8E C2             3815     C+          MOV     ES,DX
153C  5A                3816     C          POP     DX
153D  8A D8             3817     C          MOV     BL,AL                        ; NUMBER OF LINES
153F  8B C1             3818     C          MOV     AX,CX                        ; UPPER LEFT CORNER
1541  53                3819     C          PUSH    BX
1542  8A 3E 0462 R      3820     C          MOV     BH,ACTIVE_PAGE               ; ACTIVE PAGE FOR SCROLL
1546  E8 16C6 R         3821     C          CALL    GRX_PSN                      ; ADDRESS IN REGEN
1549  5B                3822     C          POP     BX
154A  8B F8             3823     C          MOV     DI,AX                        ; SET POINTER
154C  2B D1             3824     C          SUB     DX,CX                        ; DETERMINE WINDOW
154E  81 C2 0101        3825     C          ADD     DX,0101H                     ; ADJUST
1552  2A E4             3826     C          SUB     AH,AH                        ; ZERO HIGH BYTE
1554  8A C3             3827     C          MOV     AL,BL                        ; LINE COUNT
1556  52                3828     C          PUSH    DX
1557  F7 26 0485 R      3829     C          MUL     POINTS                       ; BYTES PER CHARACTER
155B  F7 26 044A R      3830     C          MUL     CRT_COLS                     ; COLUMNS
155F  8B F7             3831     C          MOV     SI,DI                        ; SET UP SOURCE INDEX
1561  03 F0             3832     C          ADD     SI,AX                        ; ADJUST
                        3833     C          ASSUME  DS:NOTHING
1563  06                3834     C          PUSH    ES
1564  1F                3835     C          POP     DS
1565  5A                3836     C          POP     DX
1566  0A DB             3837     C          OR      BL,BL                        ; LINE COUNT
1568  74 3F             3838     C          JZ      AR9
156A  8A CE             3839     C          MOV     CL,DH
156C  2A CB             3840     C          SUB     CL,BL
156E  2A ED             3841     C          SUB     CH,CH
                        3842     C
                        3843     C          ASSUME  DS:ABS0
1570  1E                3844     C          PUSH    DS
1571  E8 0CFE R         3845     C          CALL    DDS                          ; LOW MEMORY SEGMENT
1574  50                3846     C          PUSH    AX
1575  52                3847     C          PUSH    DX
1576  8B C1             3848     C          MOV     AX,CX
1578  F7 26 0485 R      3849     C          MUL     POINTS                       ; BYTES PER CHAR
157C  8B C8             3850     C          MOV     CX,AX                        ; SET THE COUNT
157E  5A                3851     C          POP     DX
157F  58                3852     C          POP     AX
                        3853     C          ASSUME  DS:NOTHING
1580  1F                3854     C          POP     DS
                        3855     C
1581  52                3856     C          PUSH    DX
1582  8B C5             3857     C          MOV     AX,BP
1584  B6 03             3858     C          MOV     DH,3
1586  B2 CE             3859     C          MOV     DL,GRAPH_ADDR                ; GRAPHICS
1588  E8 0D15 R         3860     C          CALL    OUT_DX
158B  B2 C4             3861     C          MOV     DL,SEQ_ADDR                  ; SEQUENCER
158D  B8 020F           3862     C          MOV     AX,020FH                     ; ENABLE ALL MAPS
1590  E8 0D15 R         3863     C          CALL    OUT_DX
1593  5A                3864     C          POP     DX
1594  E8 12E0 R         3865     C          CALL    CRANK                        ; SCROLL THE SCREEN
                        3866     C
1597  52                3867     C          PUSH    DX
1598  4D                3868     C          DEC     BP
1599  8B C5             3869     C          MOV     AX,BP
159B  B6 03             3870     C          MOV     DH,3
159D  B2 CE             3871     C          MOV     DL,GRAPH_ADDR
159F  E8 0D15 R         3872     C          CALL    OUT_DX
15A2  5A                3873     C          POP     DX
15A3                    3874     C  AR10:
15A3  E8 1353 R         3875     C          CALL    BLNK_3
15A6  E9 219E R         3876     C          JMP     V_RET
15A9                    3877     C  AR9:
15A9  8A DE             3878     C          MOV     BL,DH                        ; BLANK ENTIRE WINDOW
15AB  EB F6             3879     C          JMP     AR10
15AD                    3880     C  GRAPHICS_UP_2   ENDP
                        3881     C
                        3882     C  ;----- SCROLL ACTIVE DISPLAY PAGE DOWN
                        3883     C
15AD                    3884     C  SC_3:
15AD  E9 1442 R         3885     C          JMP     SCROLL_DOWN
                        3886     C
15B0                    3887     C  AH7:
                        3888     C          ASSUME  DS:ABS0
15B0  E8 12D1 R         3889     C          CALL    FLTA
15B3  8A 26 0449 R      3890     C          MOV     AH,CRT_MODE
15B7  80 FC 03          3891     C          CMP     AH,03H                       ; OLD COLOR ALPHA
15BA  76 F1             3892     C          JBE     SC_3
15BC  80 FC 07          3893     C          CMP     AH,07H                       ; MONOCHROME ALPHA
15BF  74 EC             3894     C          JE      SC_3
                        3895     C
15C1  80 FC 0D          3896     C          CMP     AH,0DH                       ; NEW GRAPHICS MODES
15C4  73 0C             3897     C          JAE     GRAPHICS_DN_2
15C6  80 FC 06          3898     C          CMP     AH,06H                       ; OLD GRAPHICS MODES
15C9  77 04             3899     C          JA      M_0
15CB  B4 07             3900     C          MOV     AH,07H
15CD  CD 42             3901     C          INT     42H
15CF                    3902     C  M_0:
15CF  E9 219E R         3903     C          JMP     V_RET
                        3904     C
15D2                    3905     C  GRAPHICS_DN_2   PROC    NEAR
15D2  FD                3906     C          STD                                  ; DIRECTION TO DECREMENT
```

```
15D3  8A D8                3907     C          MOV     BL,AL                           ; LINE COUNT
15D5  52                   3908     C          PUSH    DX                              ; SAVE LOWER RIGHT
15D6  E8 1522 R            3909     C          CALL    GR_ST_1
                           3910     C          SRLOAD  ES                              ; SET REGEN SEGMENT
15D9  8E C2                3911     C+          MOV     ES,DX
15DB  5A                   3912     C          POP     DX
15DC  8B C2                3913     C          MOV     AX,DX
15DE  FE C4                3914     C          INC     AH                              ; MOV CHAR ROW UP BY ONE
15E0  53                   3915     C          PUSH    BX
15E1  8A 3E 0462 R         3916     C          MOV     BH,ACTIVE_PAGE
15E5  E8 16C6 R            3917     C          CALL    GRX_PSN                         ; ADDRESS IN REGEN
15E8  5B                   3918     C          POP     BX
15E9  2B 06 044A R         3919     C          SUB     AX,CRT_COLS                     ; ONE SCAN OVERSHOOT
15ED  8B F8                3920     C          MOV     DI,AX
15EF  2B D1                3921     C          SUB     DX,CX                           ; CALCULATE WINDOW
15F1  81 C2 0101           3922     C          ADD     DX,0101H                        ; ADJUST COUNT
15F5  2A E4                3923     C          SUB     AH,AH
15F7  8A C3                3924     C          MOV     AL,BL
15F9  52                   3925     C          PUSH    DX
15FA  F7 26 0485 R         3926     C          MUL     POINTS                          ; BYTES PER CHAR
15FE  F7 26 044A R         3927     C          MUL     CRT_COLS                        ; BYTES PER ROW
1602  8B F7                3928     C          MOV     SI,DI
1604  2B F0                3929     C          SUB     SI,AX
                           3930     C          ASSUME  DS:NOTHING
1606  06                   3931     C          PUSH    ES                              ; SET DS TO
1607  1F                   3932     C          POP     DS                              ; THE REGEN SEGMENT
1608  5A                   3933     C          POP     DX
1609  0A DB                3934     C          OR      BL,BL                           ; SCROLL COUNT
160B  74 40                3935     C          JZ      DXR9                            ; BLANK ENTIRE WINDOW
160D  8A CE                3936     C          MOV     CL,DH
160F  2A CB                3937     C          SUB     CL,BL
1611  2A ED                3938     C          SUB     CH,CH
                           3939     C
                           3940     C          ASSUME  DS:ABS0
1613  1E                   3941     C          PUSH    DS
1614  E8 0CFE R            3942     C          CALL    DDS
1617  50                   3943     C          PUSH    AX
1618  52                   3944     C          PUSH    DX
1619  8B C1                3945     C          MOV     AX,CX
161B  F7 26 0485 R         3946     C          MUL     POINTS                          ; BYTES PER CHAR
161F  8B C8                3947     C          MOV     CX,AX
1621  5A                   3948     C          POP     DX
1622  58                   3949     C          POP     AX
                           3950     C          ASSUME  DS:NOTHING
1623  1F                   3951     C          POP     DS
                           3952     C
1624  52                   3953     C          PUSH    DX
1625  8B C5                3954     C          MOV     AX,BP
1627  B6 03                3955     C          MOV     DH,3
1629  B2 CE                3956     C          MOV     DL,GRAPH_ADDR                   ; GRAPHICS
162B  E8 0D15 R            3957     C          CALL    OUT_DX
162E  B2 C4                3958     C          MOV     DL,SEQ_ADDR                     ; SEQUENCER
1630  B8 020F              3959     C          MOV     AX,020FH                        ; ENABLE ALL MAPS
1633  E8 0D15 R            3960     C          CALL    OUT_DX
1636  5A                   3961     C          POP     DX
1637  E8 12FE R            3962     C          CALL    CRANK_4                         ; SCROLL THE SCREEN
                           3963     C
163A  52                   3964     C          PUSH    DX
163B  4D                   3965     C          DEC     BP
163C  8B C5                3966     C          MOV     AX,BP
163E  B6 03                3967     C          MOV     DH,3
1640  B2 CE                3968     C          MOV     DL,GRAPH_ADDR
1642  E8 0D15 R            3969     C          CALL    OUT_DX
1645  5A                   3970     C          POP     DX
1646                       3971     C  DXR10:
1646  E8 137B R            3972     C          CALL    BLNK_4
1649  FC                   3973     C          CLD
164A  E9 219E R            3974     C          JMP     V_RET
164D                       3975     C  DXR9:
164D  8A DE                3976     C          MOV     BL,DH                           ; BLANK ENTIRE WINDOW
164F  EB F5                3977     C          JMP     DXR10
1651                       3978     C  GRAPHICS_DN_2   ENDP
                           3979     C
                           3980     C          SUBTTL
                           3981
                           3982     C          INCLUDE         VGRW.INC
                           3983     C          SUBTTL  VGRW.INC
                           3984     C          PAGE
                           3985     C
                           3986     C          ASSUME  DS:ABS0
1651                       3987     C  FIND_POSITION   PROC    NEAR
1651  8A CF                3988     C          MOV     CL,BH                           ; DISPLAY PAGE TO CX
1653  32 ED                3989     C          XOR     CH,CH
1655  8B F1                3990     C          MOV     SI,CX                           ; MOVE TO SI FOR INDEX
1657  D1 E6                3991     C          SHL     SI,1                            ; * 2 FOR WORD OFFSET
1659  8B 84 0450 R         3992     C          MOV     AX,[SI + OFFSET CURSOR_POSN]    ; ROW/COLUMN OF THAT PAGE
165D  33 DB                3993     C          XOR     BX,BX                           ; SET START ADDRESS TO 0
165F  E3 06                3994     C          JCXZ    P5                              ; NO_PAGE
1661                       3995     C  P4:                                             ; PAGE_LOOP
1661  03 1E 044C R         3996     C          ADD     BX,CRT_LEN                      ; LENGTH OF BUFFER
1665  E2 FA                3997     C          LOOP    P4
1667                       3998     C  P5:                                             ; NO_PAGE
1667  E8 1146 R            3999     C          CALL    POSITION                        ; DETERMINE LOC IN REGEN
166A  03 D8                4000     C          ADD     BX,AX                           ; ADD TO START OF REGEN
166C  C3                   4001     C          RET
166D                       4002     C  FIND_POSITION ENDP
                           4003     C
                           4004     C  ;--------------------------------------------------------
                           4005     C  ; EXPAND_MED_COLOR                                     :
                           4006     C  ;       THIS ROUTINE EXPANDS THE LOW 2 BITS IN BL TO   :
                           4007     C  ;       FILL THE ENTIRE BX REGISTER                    :
                           4008     C  ; ENTRY                                                :
                           4009     C  ;       BL = COLOR TO BE USED ( LOW 2 BITS )           :
                           4010     C  ; EXIT                                                 :
                           4011     C  ;       BX = COLOR TO BE USED ( 8 REPLICATIONS OF THE  :
                           4012     C  ;       2 COLOR BITS )                                 :
                           4013     C  ;--------------------------------------------------------
166D                       4014     C  S19     PROC    NEAR
166D  80 E3 03             4015     C          AND     BL,3                            ; ISOLATE THE COLOR BITS
1670  8A C3                4016     C          MOV     AL,BL                           ; COPY TO AL
1672  51                   4017     C          PUSH    CX                              ; SAVE REGISTER
1673  B9 0003              4018     C          MOV     CX,3                            ; NUMBER OF TIMES
1676                       4019     C  S20:
1676  D0 E0                4020     C          SAL     AL,1
1678  D0 E0                4021     C          SAL     AL,1                            ; LEFT SHIFT BY 2
167A  0A D8                4022     C          OR      BL,AL                           ; ANOTHER COLOR VERSION
                           4023     C                                                  ;  INTO BL
167C  E2 F8                4024     C          LOOP    S20                             ; FILL ALL OF BL
167E  8A FB                4025     C          MOV     BH,BL                           ; FILL UPPER PORTION
1680  59                   4026     C          POP     CX                              ; REGISTER BACK
1681  C3                   4027     C          RET                                     ; ALL DONE
1682                       4028     C  S19     ENDP
                           4029     C  ;--------------------------------------------------------
                           4030     C  ; EXPAND_BYTE                                          :
                           4031     C  ;       THIS ROUTINE TAKES THE BYTE IN AL AND DOUBLES  :
                           4032     C  ;       ALL OF THE BITS, TURNING THE 8 BITS INTO       :
```

```
                                4033     C ;       16 BITS. THE RESULT IS LEFT IN AX               :
                                4034     C ;-------------------------------------------------------
1682                            4035     C S21     PROC    NEAR
1682  52                        4036     C         PUSH    DX                              ; SAVE REGISTERS
1683  51                        4037     C         PUSH    CX
1684  53                        4038     C         PUSH    BX
1685  2B D2                     4039     C         SUB     DX,DX                           ; RESULT REGISTER
1687  B9 0001                   4040     C         MOV     CX,1                            ; MASK REGISTER
168A                            4041     C S22:
168A  8B D8                     4042     C         MOV     BX,AX                           ; BASE INTO TEMP
168C  23 D9                     4043     C         AND     BX,CX                           ; USE MASK TO EXTRACT BIT
168E  0B D3                     4044     C         OR      DX,BX                           ; PUT INTO RESULT REGISTER
1690  D1 E0                     4045     C         SHL     AX,1
1692  D1 E1                     4046     C         SHL     CX,1                            ; SHIFT BASE AND MASK BY 1
1694  8B D8                     4047     C         MOV     BX,AX                           ; BASE TO TEMP
1696  23 D9                     4048     C         AND     BX,CX                           ; EXTRACT THE SAME BIT
1698  0B D3                     4049     C         OR      DX,BX                           ; PUT INTO RESULT
169A  D1 E1                     4050     C         SHL     CX,1                            ; SHIFT ONLY MASK NOW,
                                4051     C                                                 ; MOVING TO NEXT BASE
169C  73 EC                     4052     C         JNC     S22                             ; USE MASK BIT COMING OUT
                                4053     C                                                 ; TO TERMINATE
169E  8B C2                     4054     C         MOV     AX,DX                           ; RESULT TO PARM REGISTER
16A0  5B                        4055     C         POP     BX
16A1  59                        4056     C         POP     CX                              ; RECOVER REGISTERS
16A2  5A                        4057     C         POP     DX
16A3  C3                        4058     C         RET                                     ; ALL DONE
16A4                            4059     C S21     ENDP
                                4060     C
16A4                            4061     C S26     PROC    NEAR
16A4  A1 0450 R                 4062     C         MOV     AX,CURSOR_POSN                  ; GET CURRENT CURSOR
16A7                            4063     C GRAPH_POSN      LABEL   NEAR
16A7  53                        4064     C         PUSH    BX                              ; SAVE REGISTER
16A8  8B D8                     4065     C         MOV     BX,AX                           ; SAVE A COPY OF CURSOR
16AA  8A C4                     4066     C         MOV     AL,AH                           ; GET ROWS TO AL
16AC  F6 26 044A R              4067     C         MUL     BYTE PTR CRT_COLS               ; MULTIPLY BY BYTES/COLUMN
16B0  D1 E0                     4068     C         SHL     AX,1                            ; *4 SINCE 4 ROWS/BYTE
16B2  D1 E0                     4069     C         SHL     AX,1
16B4  2A FF                     4070     C         SUB     BH,BH                           ; ISOLATE COLUMN VALUE
16B6  03 C3                     4071     C         ADD     AX,BX                           ; DETERMINE OFFSET
16B8  5B                        4072     C         POP     BX                              ; RECOVER POINTER
16B9  C3                        4073     C         RET                                     ; ALL DONE
16BA                            4074     C S26     ENDP
                                4075     C
                                4076     C ;-------------------------------------------------------------------
                                4077     C ; GR_CUR                                                          :
                                4078     C ; ENTRY                                                           :
                                4079     C ;       BH = DISPLAY PAGE                                         :
                                4080     C ; EXIT                                                            :
                                4081     C ;       AX = CURSOR POSITION FOR REQUESTED PAGE                   :
                                4082     C ;-------------------------------------------------------------------
16BA                            4083     C GR_CUR:
                                4084     C         ASSUME DS:ABS0
16BA  53                        4085     C         PUSH    BX                              ; SAVE REGISTER
16BB  8A DF                     4086     C         MOV     BL,BH                           ; GET TO LOW BYTE
16BD  2A FF                     4087     C         SUB     BH,BH                           ; ZERO HIGH BYTE
16BF  D1 E3                     4088     C         SAL     BX,1                            ; *2 FOR WORD COUNT
16C1  8B 87 0450 R              4089     C         MOV     AX,[BX + OFFSET CURSOR_POSN]    ; CURSOR, REQUESTED PAGE
16C5  5B                        4090     C         POP     BX                              ; RECOVER REGISTER
                                4091     C
                                4092     C ;-------------------------------------------------------------------
                                4093     C ; GRX_PSN                                                         :
                                4094     C ;       AX = CURSOR POSITION IN DESIRED PAGE                      :
                                4095     C ;       BH = DESIRED PAGE                                         :
                                4096     C ; EXIT                                                            :
                                4097     C ;       AX = BYTE OFFSET INTO REGEN                               :
                                4098     C ;-------------------------------------------------------------------
16C6                            4099     C GRX_PSN PROC    NEAR
16C6  53                        4100     C         PUSH    BX                              ; SAVE
16C7  51                        4101     C         PUSH    CX                              ; SAVE
16C8  52                        4102     C         PUSH    DX                              ; SAVE
16C9  2A ED                     4103     C         SUB     CH,CH                           ; ZERO
16CB  8A CF                     4104     C         MOV     CL,BH                           ; PAGE NUMBER
16CD  8B D8                     4105     C         MOV     BX,AX                           ; ROW, COLUMN
16CF  8A C4                     4106     C         MOV     AL,AH                           ; ROW
16D1  F6 26 044A R              4107     C         MUL     BYTE PTR CRT_COLS               ; ROW * COLUMNS/ROW
16D5  F7 26 0485 R              4108     C         MUL     POINTS                          ; BYTES PER ROW
16D9  2A FF                     4109     C         SUB     BH,BH                           ; ZERO TO LEAVE COL VALUE
16DB  03 C3                     4110     C         ADD     AX,BX                           ; ADD IN COLUMN
16DD  8B 1E 044C R              4111     C         MOV     BX,CRT_LEN                      ; PAGE LENGTH
16E1  E3 04                     4112     C         JCXZ    GP_2                            ; NO PAGE OFFSET
16E3                            4113     C GP_3:
16E3  03 C3                     4114     C         ADD     AX,BX                           ; ADD IN THE PAGE LENGTH
16E5  E2 FC                     4115     C         LOOP    GP_3                            ; DO FOR NUMBER OF PAGES
16E7                            4116     C GP_2:
16E7  5A                        4117     C         POP     DX                              ; RECOVER
16E8  59                        4118     C         POP     CX                              ; RECOVER
16E9  5B                        4119     C         POP     BX                              ; RECOVER
16EA  C3                        4120     C         RET
16EB                            4121     C GRX_PSN ENDP
                                4122     C
16EB                            4123     C MK_ES:
16EB  BE B800                   4124     C         MOV     SI,0B800H
16EE  8B 3E 0410 R              4125     C         MOV     DI,EQUIP_FLAG
16F2  81 E7 0030                4126     C         AND     DI,030H
16F6  83 FF 30                  4127     C         CMP     DI,030H
16F9  75 03                     4128     C         JNE     P6_A
16FB  BE B000                   4129     C         MOV     SI,0B000H
16FE                            4130     C P6_A:
16FE  8E C6                     4131     C         MOV     ES,SI
1700  C3                        4132     C         RET
                                4133     C
                                4134     C ;-------------------------------------------------------
                                4135     C ; READ_AC_CURRENT                                       :
                                4136     C ;       THIS ROUTINE READS THE ATTRIBUTE AND CHARACTER  :
                                4137     C ;       AT THE CURRENT CURSOR POSITION AND RETURNS THEM :
                                4138     C ;       TO THE CALLER                                   :
                                4139     C ; INPUT                                                 :
                                4140     C ;       (AH) = GURRENT CRT MODE                         :
                                4141     C ;       (BH) = DISPLAY PAGE ( ALPHA MODES ONLY )        :
                                4142     C ;       (DS) = DATA SEGMENT                             :
                                4143     C ;       (ES) = REGEN SEGMENT                            :
                                4144     C ; OUTPUT                                                :
                                4145     C ;       (AL) = CHAR READ                                :
                                4146     C ;       (AH) = ATTRIBUTE READ                           :
                                4147     C ;-------------------------------------------------------
                                4148     C         ASSUME  CS:CODE,DS:ABS0,ES:NOTHING
1701                            4149     C READ_AC_CURRENT PROC    NEAR
1701  E8 16EB R                 4150     C         CALL    MK_ES
1704  E8 1651 R                 4151     C         CALL    FIND_POSITION
1707  8B F3                     4152     C         MOV     SI,BX                           ; ADDRESSING IN SI
                                4153     C
1709  8B 16 0463 R              4154     C         MOV     DX,ADDR_6845                    ; GET BASE ADDRESS
170D  83 C2 06                  4155     C         ADD     DX,6                            ; POINT AT STATUS PORT
                                4156     C
1710  F6 06 0487 R 04          4157     C         TEST    INFO,4
                                4158     C
```

```
1715  06                    4159     C          PUSH    ES
1716  1F                    4160     C          POP     DS                              ; SEGMENT FOR QUICK ACCESS
                            4161     C
1717  74 0B                 4162     C          JZ      P3A
                            4163     C
                            4164     C  ;----- WAIT FOR HORIZONTAL RETRACE
                            4165     C
1719                        4166     C  P2:                                             ; WAIT FOR RETRACE LOW
1719  EC                    4167     C          IN      AL,DX                           ; GET STATUS
171A  A8 01                 4168     C          TEST    AL,1                            ; IS HORZ RETRACE LOW
171C  75 FB                 4169     C          JNZ     P2                              ; WAIT UNTIL IT IS
171E  FA                    4170     C          CLI                                     ; NO MORE INTERRUPTS
171F                        4171     C  P3:                                             ; WAIT FOR RETRACE HIGH
171F  EC                    4172     C          IN      AL,DX                           ; GET STATUS
1720  A8 01                 4173     C          TEST    AL,1                            ; IS IT HIGH
1722  74 FB                 4174     C          JZ      P3                              ; WAIT UNTIL IT IS
1724                        4175     C  P3A:
1724  AD                    4176     C          LODSW                                   ; GET THE CHAR/ATTR
1725  E9 219E R             4177     C          JMP     V_RET
1728                        4178     C  READ_AC_CURRENT ENDP
                            4179     C
                            4180     C  ;--------------------------------------------------------
                            4181     C  ; MED_READ_BYTE                                        :
                            4182     C  ;       THIS ROUTINE WILL TAKE 2 BYTES FROM THE REGEN  :
                            4183     C  ;       BUFFER, COMPARE AGAINST THE CURRENT FOREGROUND :
                            4184     C  ;       COLOR, AND PLACE THE CORRESPONDING ON/OFF BIT  :
                            4185     C  ;       PATTERN INTO THE CURRENT POSITION IN THE SAVE  :
                            4186     C  ;                                                      :
                            4187     C  ; ENTRY                                                :
                            4188     C  ;       SI,DS = POINTER TO REGEN AREA OF INTEREST      :
                            4189     C  ;       BX = EXPANDED FOREGROUND COLOR                 :
                            4190     C  ;       BP = POINTER TO SAVE AREA                      :
                            4191     C  ; EXIT                                                 :
                            4192     C  ;       BP IS INCREMENT AFTER SAVE                     :
                            4193     C  ;--------------------------------------------------------
1728                        4194     C  S23     PROC    NEAR
1728  8A 24                 4195     C          MOV     AH,[SI]                         ; GET FIRST BYTE
172A  8A 44 01              4196     C          MOV     AL,[SI+1]                       ; GET SECOND BYTE
172D  B9 C000               4197     C          MOV     CX,0C000H                       ; 2 BIT MASK TO TEST
                            4198     C                                                  ;  THE ENTRIES
1730  B2 00                 4199     C          MOV     DL,0                            ; RESULT REGISTER
1732                        4200     C  S24:
1732  85 C1                 4201     C          TEST    AX,CX                           ; IS, THIS, BACKGROUND?
1734  F8                    4202     C          CLC                                     ; CLEAR CARRY IN HOPES
                            4203     C                                                  ;  THAT IT IS
1735  74 01                 4204     C          JZ      S25                             ; IF 0, IT IS BACKGROUND
1737  F9                    4205     C          STC                                     ; WASNT, SO SET CARRY
1738                        4206     C  S25:
1738  D0 D2                 4207     C          RCL     DL,1                            ; MOVE THAT BIT INTO THE
173A  D1 E9                 4208     C          SHR     CX,1                            ; RESULT
173C  D1 E9                 4209     C          SHR     CX,1                            ; MOVE THE MASK TO THE
                            4210     C                                                  ; RIGHT BY 2 BITS
173E  73 F2                 4211     C          JNC     S24                             ; DO IT AGAIN IF MASK
                            4212     C                                                  ; DIDNT FALL OUT
1740  88 56 00              4213     C          MOV     [BP],DL                         ; STORE RESULT LN SAVE
1743  45                    4214     C          INC     BP                              ; ADJUST POINTER
1744  C3                    4215     C          RET                                     ; ALL DONE
1745                        4216     C  S23     ENDP
                            4217     C
                            4218     C
1745                        4219     C  GRAPHICS_READ PROC    NEAR
1745  E8 16EB R             4220     C          CALL    MK_ES
1748  E8 16A4 R             4221     C          CALL    S26                             ; CONVERTED TO OFFSET
174B  8B F0                 4222     C          MOV     SI,AX                           ; SAVE IN SI
174D  83 EC 08              4223     C          SUB     SP,8                            ; ALLOCATE SPACE TO SAVE
                            4224     C                                                  ; THE READ CODE POINT
1750  8B EC                 4225     C          MOV     BP,SP                           ; POINTER TO SAVE AREA
                            4226     C
                            4227     C  ;----- DETERMINE GRAPHICS MODES
                            4228     C
1752  80 3E 0449 R 06       4229     C          CMP     CRT_MODE,6
1757  06                    4230     C          PUSH    ES
1758  1F                    4231     C          POP     DS                              ; POINT TO REGEN SEGMENT
1759  72 1A                 4232     C          JC      S13P                            ; MEDIUM RESOLUTION
                            4233     C
                            4234     C  ;----- HIGH RESOLUTION READ
                            4235     C
                            4236     C  ;----- GET VALUES FROM REGEN BUFFER AND CONVERT TO CODE POINT
                            4237     C
175B  B6 04                 4238     C          MOV     DH,4                            ; NUMBER OF PASSES
175D                        4239     C  S12P:
175D  8A 04                 4240     C          MOV     AL,[SI]                         ; GET FIRST BYTE
175F  88 46 00              4241     C          MOV     [BP],AL                         ; SAVE IN STORAGE AREA
1762  45                    4242     C          INC     BP                              ; NEXT LOCATION
1763  8A 84 2000           4243     C          MOV     AL,[SI+2000H]                   ; GET LOWER REGION BYTE
1767  88 46 00              4244     C          MOV     [BP],AL                         ; ADJUST AND STORE
176A  45                    4245     C          INC     BP
176B  83 C6 50              4246     C          ADD     SI,80                           ; POINTER INTO REGEN
176E  FE CE                 4247     C          DEC     DH                              ; LOOP CONTROL
1770  75 EB                 4248     C          JNZ     S12P                            ; DO IT SOME MORE
1772  EB 17 90              4249     C          JMP     S15P                            ; GO MATCH THE SAVED CODE
                            4250     C                                                  ;  POINTS
                            4251     C
                            4252     C  ;----- MEDIUM RESOLUTION READ
                            4253     C
1775                        4254     C  S13P:                                           ; MED_RES_READ
1775  D1 E6                 4255     C          SHL     SI,1                            ; OFFSET*2, 2 BYTES/CHAR
1777  B6 04                 4256     C          MOV     DH,4                            ; NUMBER OF PASSES
1779                        4257     C  S14P:
1779  E8 1728 R             4258     C          CALL    S23                             ; GET PAIR BYTES
                            4259     C                                                  ;  INTO SINGLE SAVE
177C  81 C6 2000           4260     C          ADD     SI,2000H                        ; GO TO LOWER REGION
1780  E8 1728 R             4261     C          CALL    S23                             ; GET. THIS PAIR INTO SAVE
1783  81 EE 1FB0           4262     C          SUB     SI,2000H-80                     ; ADJUST POINTER BACK INTO
1787  FE CE                 4263     C          DEC     DH                              ;  UPPER
1789  75 EE                 4264     C          JNZ     S14P                            ; KEEP GOING UNTIL 8 DONE
                            4265     C
                            4266     C  ;----- SAVE AREA HAS CHARACTER IN IT, MATCH IT
                            4267     C
178B                        4268     C  S15P:                                           ; FIND_CHAR
178B  1E                    4269     C          PUSH    DS
178C  E8 0CFE R             4270     C          CALL    DDS
178F  C4 3E 010C R          4271     C          LES     DI,GRX_SET                      ; ESTABLISH ADDRESSING
1793  1F                    4272     C          POP     DS
1794  83 ED 08              4273     C          SUB     BP,8                            ; ADJUST, POINTER. TO
                            4274     C                                                  ;  BEGINNING OF SAVE AREA
1797  8B F5                 4275     C          MOV     SI,BP
1799  FC                    4276     C          CLD                                     ; ENSURE DIRECTION
179A  B0 00                 4277     C          MOV     AL,0                            ; CURRENT CODE POINT BEING
179C                        4278     C  S16P:                                           ;  MATCHED
179C  16                    4279     C          PUSH    SS                              ; ADDRESSING TO STACK
179D  1F                    4280     C          POP     DS                              ; FOR THE STRING COMPARE
179E  BA 0080               4281     C          MOV     DX,128                          ; NUMBER TO TEST AGAINST
17A1                        4282     C  S17P:
17A1  56                    4283     C          PUSH    SI                              ; SAVE SAVE AREA. POINTER
17A2  57                    4284     C          PUSH    DI                              ; SAVE CODE POINTER
```

```
17A3  B9 0008              4285     C          MOV     CX,8                            ; NUMBER OF BYTES TO MATCH
17A6  F3/ A6               4286     C          REPE    CMPSB                           ; COMPARE THE 8 BYTES
17A8  5F                   4287     C          POP     DI                              ; RECOVER THE POINTERS
17A9  5E                   4288     C          POP     SI
17AA  74 1D                4289     C          JZ      S18P                            ; IF ZERO FLAG SET,
                           4290     C                                                  ;  THEN MATCH OCCURRED
17AC  FE C0                4291     C          INC     AL                              ; NO MATCH, MOVE TO NEXT
17AE  83 C7 08             4292     C          ADD     DI,8                            ; NEXT CODE POINT
17B1  4A                   4293     C          DEC     DX                              ; LOOP CONTROL
17B2  75 ED                4294     C          JNZ     S17P                            ; DO ALL OF THEM
                           4295     C
                           4296     C  ;----- CHAR NOT MATCHED, MIGHT BE IN USER SUPPLIED SECOND HALF
                           4297     C
17B4  3C 00                4298     C          CMP     AL,0                            ; AL <> 0 LF ONLY 1ST
                           4299     C                                                  ;  HALF SCANNED
17B6  74 11                4300     C          JE      S18P                            ; IF = 0, THEN ALL HAS
                           4301     C                                                  ;  BEEN SCANNED
                           4302     C          ASSUME  DS:ABS0
17B8  E8 0CFE R            4303     C          CALL    DDS
17BB  C4 3E 007C R         4304     C          LES     DI,EXT_PTR                      ; GET POINTER
17BF  8C C0                4305     C          MOV     AX,ES                           ; SEE IF THE PNTR EXISTS
17C1  0B C7                4306     C          OR      AX,DI                           ; IF ALL 0, DOESNT EXIST
17C3  74 04                4307     C          JZ      S18P                            ; NO SENSE LOOKING
17C5  B0 80                4308     C          MOV     AL,128                          ; ORIGIN FOR SECOND HALF
17C7  EB D3                4309     C          JMP     S16P                            ; GO BACK AND TRY FOR IT
                           4310     C
                           4311     C  ;----- CHARACTER IS FOUND ( AL=0 IF NOT FOUND )
                           4312     C
17C9                       4313     C  S18P:
17C9  83 C4 08             4314     C          ADD     SP,8                            ; READJUST THE STACK,
                           4315     C                                                  ;  THROW AWAY SAVE
17CC  E9 219E R            4316     C          JMP     V_RET                           ; ALL DONE
17CF                       4317     C  GRAPHICS_READ ENDP
                           4318     C
                           4319     C
                           4320     C  ;----- READ CHARACTER/ATTRIBUTE AT CURRENT CURSOR POSITION
                           4321     C
17CF                       4322     C  AH8S:
17CF  E9 1701 R            4323     C          JMP     READ_AC_CURRENT
                           4324     C
17D2                       4325     C  AH8:
                           4326     C          ASSUME  DS:ABS0
17D2  8A 26 0449 R         4327     C          MOV     AH,CRT_MODE                     ; GET THE CURRENT MODE
17D6  80 FC 07             4328     C          CMP     AH,07H
17D9  74 F4                4329     C          JE      AH8S
17DB  80 FC 03             4330     C          CMP     AH,03H
17DE  76 EF                4331     C          JBE     AH8S
17E0  80 FC 06             4332     C          CMP     AH,06H
17E3  77 03                4333     C          JA      Z_1
17E5  E9 1745 R            4334     C          JMP     GRAPHICS_READ
17E8                       4335     C  Z_1:
17E8  80 FC 0F             4336     C          CMP     AH,0FH
17EB  72 52                4337     C          JB      GRX_RD2
17ED  E8 14F7 R            4338     C          CALL    MEM_DET
17F0  72 4D                4339     C          JC      GRX_RD2
17F2  EB 0A                4340     C          JMP     SHORT GRX_RD1
17F4  80 FC 0D             4341     C          CMP     AH,0DH                          ; RANGE TEST
17F7  73 46                4342     C          JAE     GRX_RD2                         ; FOUR MAP READ
17F9  B0 00                4343     C          MOV     AL,0
17FB  E9 219E R            4344     C          JMP     V_RET
                           4345     C
17FE                       4346     C  GRX_RD1 PROC    NEAR
                           4347     C          ASSUME  DS:ABS0
                           4348     C          SRLOAD  ES,0A000H                       ; REGEN SEGEMNT
17FE  BA A000              4349     C+          MOV     DX,0A000H
1801  8E C2               4350     C+          MOV     ES,DX
1803  E8 16BA R            4351     C          CALL    GR_CUR                          ; BYTE OFFSET INTO REGEN
1806  8B F0                4352     C          MOV     SI,AX                           ; SAVE IN SI
1808  8B 1E 0485 R         4353     C          MOV     BX,POINTS                       ; BYTES PER CHARACTER
180C  2B E3                4354     C          SUB     SP,BX                           ; ALLOCATE SPACE TO SAVE
                           4355     C                                                  ;  THE READ CODE POINT
180E  8B EC                4356     C          MOV     BP,SP                           ; POINTER TO SAVE AREA
                           4357     C
                           4358     C  ;----- GET VALUES FROM REGEN BUFFER AND CONVERT TO CODE POINT
                           4359     C
1810  53                   4360     C          PUSH    BX                              ; SAVE BYTES PER CHARACTER
1811  24 01                4361     C          AND     AL,1                            ; ODD OR EVEN BYTE
1813  8A C8                4362     C          MOV     CL,AL                           ; USE FOR SHIFT
1815  B0 05                4363     C          MOV     AL,5                            ; COLOR COMP VALUE (C0-C2)
1817  D2 E0                4364     C          SHL     AL,CL                           ; (C1-C3) IF ODD BYTE
1819  B4 07                4365     C          MOV     AH,G_COLOR                      ; COLOR COMPARE REGISTER
181B  B6 03                4366     C          MOV     DH,3
181D  B2 CE                4367     C          MOV     DL,GRAPH_ADDR
181F  E8 0D15 R            4368     C          CALL    OUT_DX                          ; SET GRAPHICS CHIP
1822  B8 0518              4369     C          MOV     AX,518H                         ; READ MODE
1825  E8 0D15 R            4370     C          CALL    OUT_DX                          ; SET GRAPHICS CHIP
1828                       4371     C  S12_1:
1828  26: 8A 04            4372     C          MOV     AL,ES:[SI]                      ; GET FIRST BYTE
182B  F6 D0                4373     C          NOT     AL
182D  88 46 00             4374     C          MOV     SS:[BP],AL                      ; SAVE IN STORAGE AREA
1830  45                   4375     C          INC     BP                              ; NEXT LOCATION
1831  03 36 044A R         4376     C          ADD     SI,CRT_COLS                     ; POINTER INTO REGEN
1835  4B                   4377     C          DEC     BX                              ; LOOP CONTROL
1836  75 F0                4378     C          JNZ     S12_1                           ; DO IT SOME MORE
1838  5B                   4379     C          POP     BX                              ; RECOVER BYTES PER CHAR
1839  B8 0510              4380     C          MOV     AX,510H                         ; UNDO READ MODE
183C  EB 32 90             4381     C          JMP     GRX_RECG                        ; CHAR REGONTION ROUTINE
183F                       4382     C  GRX_RD1 ENDP
                           4383     C
183F                       4384     C  GRX_RD2 PROC    NEAR
                           4385     C          ASSUME  DS:ABS0
                           4386     C          SRLOAD  ES,0A000H                       ; REGEN SEGMENT
183F  BA A000              4387     C+          MOV     DX,0A000H
1842  8E C2               4388     C+          MOV     ES,DX
1844  E8 16BA R            4389     C          CALL    GR_CUR                          ; BYTE OFFSET INTO REGEN
1847  8B F0                4390     C          MOV     SI,AX                           ; SAVE IN SI
1849  8B 1E 0485 R         4391     C          MOV     BX,POINTS                       ; BYTES PER CHARACTER
184D  2B E3                4392     C          SUB     SP,BX                           ; ALLOCATE SPACE TO SAVE
                           4393     C                                                  ;  THE READ CODE POINT
184F  8B EC                4394     C          MOV     BP,SP                           ; POINTER TO SAVE AREA
                           4395     C
                           4396     C  ;----- GET VALUES FROM REGEN BUFFER AND CONVERT TO CODE POINT
                           4397     C
1851  B6 03                4398     C          MOV     DH,3
1853  B2 CE                4399     C          MOV     DL,GRAPH_ADDR                   ; GRAPHICS CHIP
1855  B8 0508              4400     C          MOV     AX,508H                         ; COLOR COMPARE
1858  E8 0D15 R            4401     C          CALL    OUT_DX                          ; SET THE REGISTER
185B  53                   4402     C          PUSH    BX                              ; SAVE BYTES PER CHARACTER
185C                       4403     C  S12:
185C  26: 8A 04            4404     C          MOV     AL,ES:[SI]                      ; GET COLOR COMPARED BYTE
185F  F6 D0                4405     C          NOT     AL                              ; ADJUST
1861  88 46 00             4406     C          MOV     SS:[BP],AL                      ; SAVE IN STORAGE AREA
1864  45                   4407     C          INC     BP                              ; NEXT LOCATION
1865  03 36 044A R         4408     C          ADD     SI,CRT_COLS                     ; POINTER INTO REGEN
1869  4B                   4409     C          DEC     BX                              ; LOOP CONTROL
186A  75 F0                4410     C          JNZ     S12                             ; DO IT SOME MORE
```

```
186C  5B                  4411     C          POP     BX                              ; RECOVER BYTES PER CHAR
186D  B8 0500             4412     C          MOV     AX,500H                         ; UNDO READ MODE
1870                      4413     C  GRX_RD2 ENDP
                          4414     C
1870                      4415     C  GRX_RECG:
                          4416     C
                          4417     C  ;----- SAVE AREA HAS CHARACTER IN IT, MATCH IT
                          4418     C
1870  E8 0D15 R           4419     C          CALL    OUT_DX                          ; SET READ MODE BACK
1873  C4 3E 010C R        4420     C          LES     DI,GRX_SET                      ; GET FONT DEFINITIONS
1877  2B EB               4421     C          SUB     BP,BX                           ; ADJUST POINTER TO
                          4422     C                                                  ; BEGINNING OF SAVE AREA
1879  8B F5               4423     C          MOV     SI,BP
187B  FC                  4424     C          CLD                                     ; ENSURE DIRECTION
187C  B0 00               4425     C          MOV     AL,0                            ; CODE POINT BEING MATCHED
187E  16                  4426     C          PUSH    SS                              ; ADDRESSING TO STACK
187F  1F                  4427     C          POP     DS                              ;  FOR THE STRING COMPARE
1880  BA 0100             4428     C          MOV     DX,256D                         ; NUMBER TO TEST AGAINST
1883                      4429     C  S17_5:
1883  56                  4430     C          PUSH    SI                              ; SAVE SAVE AREA POINTER
1884  57                  4431     C          PUSH    DI                              ; SAVE CODE POINTER
1885  8B CB               4432     C          MOV     CX,BX                           ; NUMBER OF BYTES TO MATCH
1887  F3/ A6              4433     C          REPE    CMPSB                           ; COMPARE THE 8 BYTES
1889  5F                  4434     C          POP     DI                              ; RECOVER THE POINTERS
188A  5E                  4435     C          POP     SI
188B  74 07               4436     C          JZ      S18_5                           ; IF ZFL SET, THEN MATCH
                          4437     C                                                  ;  OCCURRED
188D  FE C0               4438     C          INC     AL                              ; NO MATCH, ON TO NEXT
188F  03 FB               4439     C          ADD     DI,BX                           ; NEXT CODE POINT
1891  4A                  4440     C          DEC     DX                              ; LOOP CONTROL
1892  75 EF               4441     C          JNZ     S17_5                           ; DO ALL OF THEM
1894                      4442     C  S18_5:                                          ; AL=CHAR, IF NOT FOUND
1894  03 E3               4443     C          ADD     SP,BX                           ; READJUST THE STACK
1896  E9 219E R           4444     C          JMP     V_RET
                          4445     C
                          4446     C  ;----- WRITE CHARACTER/ATTRIBUTE AT CURRENT CURSOR POSITION
                          4447     C
                          4448     C  ;--------------------------------------------------
                          4449     C  ; WRITE_AC_CURRENT                              :
                          4450     C  ;       THIS ROUTINE WRITES THE ATTRIBUTE       :
                          4451     C  ;       AND CHARACTER AT THE CURRENT CURSOR     :
                          4452     C  ;       POSITION                                :
                          4453     C  ; INPUT:                                        :
                          4454     C  ;       (AH) = CURRENT CRT MODE                 :
                          4455     C  ;       (BH) = DISPLAY PAGE                     :
                          4456     C  ;       (CX) = COUNT OF CHARACTERS TO WRITE     :
                          4457     C  ;       (AL) = CHAR TO WRITE                    :
                          4458     C  ;       (BL) = ATTRIBUTE OF CHAR TO WRITE       :
                          4459     C  ;       (DS) = DATA SEGMENT                     :
                          4460     C  ;       (ES) = REGEN SEGMENT                    :
                          4461     C  ; OUTPUT                                        :
                          4462     C  ;       NONE                                    :
                          4463     C  ;--------------------------------------------------
1899                      4464     C  AH9:
                          4465     C          ASSUME  DS:ABS0
1899  E8 0CFE R           4466     C          CALL    DDS
189C  8A 26 0449 R        4467     C          MOV     AH,CRT_MODE
                          4468     C
18A0  80 FC 04            4469     C          CMP     AH,4                            ; IS THIS GRAPHICS
18A3  72 08               4470     C          JC      P6
18A5  80 FC 07            4471     C          CMP     AH,7                            ; IS THIS BW CARD
18A8  74 03               4472     C          JE      P6
18AA  EB 74 90            4473     C          JMP     GRAPHICS_WRITE
18AD                      4474     C  P6:                                             ; WRITE_AC_CONTINUE
18AD  E8 16EB R           4475     C          CALL    MK_ES
18B0  8A E3               4476     C          MOV     AH,BL                           ; GET ATTRIBUTE TO AH
18B2  50                  4477     C          PUSH    AX                              ; SAVE ON STACK
18B3  51                  4478     C          PUSH    CX                              ; SAVE WRITE COUNT
18B4  E8 1651 R           4479     C          CALL    FIND_POSITION
18B7  8B FB               4480     C          MOV     DI,BX                           ; ADDRESS TO DI REGISTER
18B9  59                  4481     C          POP     CX                              ; WRITE COUNT
18BA  5B                  4482     C          POP     BX                              ; CHARACTER IN BX REG
18BB  8B 16 0463 R        4483     C          MOV     DX,ADDR_6845                    ; GET BASE ADDRESS
18BF  83 C2 06            4484     C          ADD     DX,6                            ; POINT AT STATUS PORT
                          4485     C
                          4486     C  ;----- WAIT FOR HORIZONTAL RETRACE
                          4487     C
18C2                      4488     C  P7:
18C2  F6 06 0487 R 04     4489     C          TEST    INFO,4
18C7  74 0B               4490     C          JZ      P9A
18C9                      4491     C  P8:
18C9  EC                  4492     C          IN      AL,DX                           ; GET STATUS
18CA  A8 01               4493     C          TEST    AL,1                            ; IS IT LOW
18CC  75 FB               4494     C          JNZ     P8                              ; WAIT UNTIL IT IS
18CE  FA                  4495     C          CLI                                     ; NO MORE INTERRUPTS
18CF                      4496     C  P9:
18CF  EC                  4497     C          IN      AL,DX                           ; GET STATUS
18D0  A8 01               4498     C          TEST    AL,1                            ; IS IT HIGH
18D2  74 FB               4499     C          JZ      P9                              ; WAIT UNTIL IT IS
18D4                      4500     C  P9A:
18D4  8B C3               4501     C          MOV     AX,BX                           ; RECOVER THE CHAR/ATTR
18D6  AB                  4502     C          STOSW                                   ; PUT THE CHAR/ATTR
18D7  FB                  4503     C          STI                                     ; INTERRUPTS BACK ON
18D8  E2 E8               4504     C          LOOP    P7                              ; AS MANY TIMES
18DA  E9 219E R           4505     C          JMP     V_RET
                          4506     C
                          4507     C  ;----- WRITE CHARACTER ONLY AT CURRENT CURSOR POSITION
                          4508     C
                          4509     C  ;--------------------------------------------------
                          4510     C  ; WRITE_C_CURRENT                               :
                          4511     C  ;       THIS ROUTINE WRITES THE CHARACTER AT    :
                          4512     C  ;       THE CURRENT CURSOR POSITION, ATTRIBUTE  :
                          4513     C  ;       UNCHANGED                               :
                          4514     C  ; INPUT                                         :
                          4515     C  ;       (AH) = CURRENT CRT MODE                 :
                          4516     C  ;       (BH) = DISPLAY PAGE                     :
                          4517     C  ;       (CX) = COUNT OF CHARACTERS TO WRITE     :
                          4518     C  ;       (AL) = CHAR TO WRITE                    :
                          4519     C  ;       (DS) = DATA SEGMENT                     :
                          4520     C  ;       (ES) = REGEN SEGMENT                    :
                          4521     C  ; OUTPUT                                        :
                          4522     C  ;       NONE                                    :
                          4523     C  ;--------------------------------------------------
18DD                      4524     C  AHA:
                          4525     C          ASSUME  DS:ABS0
18DD  E8 0CFE R           4526     C          CALL    DDS
18E0  8A 26 0449 R        4527     C          MOV     AH,CRT_MODE
                          4528     C
18E4  80 FC 04            4529     C          CMP     AH,4                            ; IS THIS GRAPHICS
18E7  72 08               4530     C          JC      P10
18E9  80 FC 07            4531     C          CMP     AH,7                            ; IS THIS BW CARD
18EC  74 03               4532     C          JE      P10
                          4533     C
18EE  EB 30 90            4534     C          JMP     GRAPHICS_WRITE
18F1                      4535     C  P10:
18F1  E8 16EB R           4536     C          CALL    MK_ES
```

```
18F4  50                    4537     C          PUSH    AX                              ; SAVE ON STACK
18F5  51                    4538     C          PUSH    CX                              ; SAVE WRITE COUNT
18F6  E8 1651 R             4539     C          CALL    FIND_POSITION
18F9  8B FB                 4540     C          MOV     DI,BX                           ; ADDRESS TO DI
18FB  59                    4541     C          POP     CX                              ; WRITE COUNT
18FC  5B                    4542     C          POP     BX                              ; BL HAS CHAR TO WRITE
                            4543     C
                            4544     C  ;----- WAIT FOR HORIZONTAL RETRACE
                            4545     C
18FD  8B 16 0463 R          4546     C          MOV     DX,ADDR_6845                    ; GET BASE ADDRESS
1901  83 C2 06              4547     C          ADD     DX,6                            ; POINT AT STATUS PORT
1904                        4548     C  P11:
1904  F6 06 0487 R 04       4549     C          TEST    INFO,4
1909  74 0B                 4550     C          JZ      P13A
190B                        4551     C  P12:
190B  EC                    4552     C          IN      AL,DX                           ; GET STATUS
190C  A8 01                 4553     C          TEST    AL,1                            ; IS IT LOW
190E  75 FB                 4554     C          JNZ     P12                             ; WAIT UNTIL IT IS
1910  FA                    4555     C          CLI                                     ; NO MORE INTERRUPTS
1911                        4556     C  P13:
1911  EC                    4557     C          IN      AL,DX                           ; GET STATUS
1912  A8 01                 4558     C          TEST    AL,1                            ; IS IT HIGH
1914  74 FB                 4559     C          JZ      P13                             ; WAIT UNTIL IT IS
1916                        4560     C  P13A:
1916  8A C3                 4561     C          MOV     AL,BL                           ; RECOVER CHAR
1918  AA                    4562     C          STOSB                                   ; PUT THE CHAR/ATTR
1919  FB                    4563     C          STI                                     ; INTERRUPTS BACK ON
191A  47                    4564     C          INC     DI                              ; BUMP POINTER PAST ATTR
191B  E2 E7                 4565     C          LOOP    P11                             ;  AS REQUESTED
191D  E9 219E R             4566     C          JMP     V_RET
                            4567     C
                            4568     C  ;--------------------------------------------------------------
                            4569     C  ; GRAPHICS WRITE                                             :
                            4570     C  ;       THIS ROUTINE WRITES THE ASCII CHARACTER TO THE       :
                            4571     C  ;       CURRENT POSITION ON THE SCREEN.                      :
                            4572     C  ; ENTRY                                                      :
                            4573     C  ;       AL = CHARACTER TO WRITE                              :
                            4574     C  ;       BL = COLOR ATTRIBUTE TO BE USED FOR FOREGROUND COLOR :
                            4575     C  ;        IF BIT 7 IS SET, THE CHAR IS XORD INTO THE REGEN    :
                            4576     C  ;        BUFFER (0 IS USED FOR THE BACKGROUND COLOR)         :
                            4577     C  ;       CX = NUMBER OF CHARS TO WRITE                        :
                            4578     C  ;       DS = DATA SEGMENT                                    :
                            4579     C  ;       ES = REGEN SEGMENT                                   :
                            4580     C  ; EXIT                                                       :
                            4581     C  ;       NOTHING IS RETURNED                                  :
                            4582     C  ;                                                            :
                            4583     C  ; GRAPHICS READ                                              :
                            4584     C  ;       THIS ROUTINE READS THE ASCII CHARACTER AT THE CURRENT :
                            4585     C  ;       CURSOR POSITION ON THE SCREEN BY MATCHING THE DOTS ON :
                            4586     C  ;       THE SCREEN TO THE CHARACTER GENERATOR CODE POINTS     :
                            4587     C  ; ENTRY                                                      :
                            4588     C  ;       NONE  (0 IS ASSUMED AS THE BACKGROUND COLOR)         :
                            4589     C  ; EXIT                                                       :
                            4590     C  ;       AL = CHARACTER READ AT THAT POSITION (0 RETURNED IF   :
                            4591     C  ;            NONE FOUND)                                     :
                            4592     C  ;                                                            :
                            4593     C  ; FOR COMPATIBILITY ROUTINES, THE IMAGES USED TO FORM CHARS ARE :
                            4594     C  ; CONTAINED IN ROM FOR THE 1ST 128 CHARS. TO ACCESS CHARS    :
                            4595     C  ;  IN THE SECOND HALF, THE USER MUST INITIALIZE THE VECTOR AT :
                            4596     C  ;  INTERRUPT 1FH (LOCATION 0007CH) TO POINT TO THE USER      :
                            4597     C  ;  SUPPLIED TABLE OF GRAPHIC IMAGES (8X8 BOXES).            :
                            4598     C  ;  FAILURE TO DO SO WILL CAUSE IN STRANGE RESULTS            :
                            4599     C  ;--------------------------------------------------------------
                            4600     C          ASSUME  CS:CODE,DS:ABS0,ES:NOTHING
1920                        4601     C  GRAPHICS_WRITE  PROC    NEAR
1920  80 FC 07              4602     C          CMP     AH,7
1923  72 03                 4603     C          JB      S1_A
1925  E9 19D7 R             4604     C          JMP     GRX_WRT
1928                        4605     C  S1_A:
1928  E8 16EB R             4606     C          CALL    MK_ES
192B  B4 00                 4607     C          MOV     AH,0                            ; 0 TO HIGH OF CODE POINT
192D  50                    4608     C          PUSH    AX                              ; SAVE CODE POINT VALUE
                            4609     C
                            4610     C  ;----- DETERMINE POSITION IN REGEN BUFFER TO PUT CODE POINTS
                            4611     C
192E  E8 16A4 R             4612     C          CALL    S26                             ; LOC IN REGEN BUFFER
1931  8B F8                 4613     C          MOV     DI,AX                           ; REGEN POINTER IN DI
                            4614     C
                            4615     C  ;----- DETERMINE REGION TO GET CODE POINTS FROM
                            4616     C
1933  58                    4617     C          POP     AX                              ; RECOVER CODE POINT
1934  3C 80                 4618     C          CMP     AL,80H                          ; IS IT IN SECOND HALF
1936  73 06                 4619     C          JAE     S1                              ; YES
                            4620     C
                            4621     C  ;----- IMAGE IS IN FIRST HALF, CONTAINED IN ROM
                            4622     C
1938  C5 36 010C R          4623     C          LDS     SI,GRX_SET
193C  EB 06                 4624     C          JMP     SHORT S2                        ; DETERMINE_MODE
                            4625     C
                            4626     C  ;----- IMAGE IS IN SECOND HALF, IN USER RAM
                            4627     C
193E                        4628     C  S1:                                             ; EXTEND_CHAR
193E  2C 80                 4629     C          SUB     AL,80H                          ; 0 ORIGIN FOR SECOND HALF
1940  C5 36 007C R          4630     C          LDS     SI,EXT_PTR
                            4631     C
                            4632     C  ;----- DETERMINE GRAPHICS MODE IN OPERATION
                            4633     C
1944                        4634     C  S2:                                             ; DETERMINE MODE
1944  D1 E0                 4635     C          SAL     AX,1                            ; MULTIPLY CODE POINT
1946  D1 E0                 4636     C          SAL     AX,1                            ;  VALUE BY 8
1948  D1 E0                 4637     C          SAL     AX,1
194A  03 F0                 4638     C          ADD     SI,AX                           ; SI HAS OFFSET OF
194C  1E                    4639     C          PUSH    DS                              ;  DESIRES CODES
194D  E8 0CFE R             4640     C          CALL    DDS
1950  80 3E 0449 R 06       4641     C          CMP     CRT_MODE,6
1955  1F                    4642     C          POP     DS
1956  72 2C                 4643     C          JC      S7                              ; TEST FOR MEDIUM RES MODE
                            4644     C
                            4645     C  ;----- HIGH RESOLUTION MODE
                            4646     C
1958                        4647     C  S3:                                             ; HIGH_CHAR
1958  57                    4648     C          PUSH    DI                              ; SAVE REGEN POINTER
1959  56                    4649     C          PUSH    SI                              ; SAVE CODE POINTER
195A  B6 04                 4650     C          MOV     DH,4                            ; NUMBER OF TIMES THROUGH
195C                        4651     C  S4:                                             ;  LOOP
195C  AC                    4652     C          LODSB                                   ; GET BYTE FROM CODE POINT
195D  F6 C3 80              4653     C          TEST    BL,80H                          ; SHOULD WE USE THE
1960  75 16                 4654     C          JNZ     S6                              ;  FUNCTION TO PUT CHAR IN
1962  AA                    4655     C          STOSB                                   ; STORE IN REGEN BUFFER
1963  AC                    4656     C          LODSB
1964                        4657     C  S5:
1964  26: 88 85 1FFF        4658     C          MOV     ES:[DI+2000H-1],AL              ; STORE IN SECOND HALF
1969  83 C7 4F              4659     C          ADD     DI,79                           ; MOVE TO NEXT ROW IN REGEN
196C  FE CE                 4660     C          DEC     DH                              ; DONE WITH LOOP
196E  75 EC                 4661     C          JNZ     S4
1970  5E                    4662     C          POP     SI
```

```
1971  5F                    4663     C          POP     DI                              ; RECOVER REGEN POINTER
1972  47                    4664     C          INC     DI                              ; POINT TO NEXT CHAR POS
1973  E2 E3                 4665     C          LOOP    S3                              ; MORE CHARS TO WRITE
1975  E9 219E R             4666     C          JMP     V_RET
1978                        4667     C  S6:
1978  26: 32 05             4668     C          XOR     AL,ES:[DI]                      ; XOR WITH CURRENT
197B  AA                    4669     C          STOSB                                   ; STORE THE CODE POINT
197C  AC                    4670     C          LODSB                                   ; AGAIN FOR ODD FIELD
197D  26: 32 85 1FFF        4671     C          XOR     AL,ES:[DI+2000H-1]
1982  EB E0                 4672     C          JMP     S5                              ; BACK TO MAINSTREAM
                            4673     C
                            4674     C  ;----- MEDIUM RESOLUTION WRITE
                            4675     C
1984                        4676     C  S7:                                             ; MED_RES_WRITE
1984  8A D3                 4677     C          MOV     DL,BL                           ; SAVE HIGH COLOR BIT
1986  D1 E7                 4678     C          SAL     DI,1                            ; OFFSET*2, 2 BYTES/CHAR
1988  E8 166D R             4679     C          CALL    S19                             ; EXPAND BL TO FULL WORD
198B                        4680     C  S8:                                             ;  OF COLOR
198B  57                    4681     C          PUSH    DI                              ; SAVE REGEN POINTER
198C  56                    4682     C          PUSH    SI                              ; SAVE THE CODE POINTER
198D  B6 04                 4683     C          MOV     DH,4                            ; NUMBER OF LOOPS
198F                        4684     C  S9:
198F  AC                    4685     C          LODSB                                   ; GET CODE POINT
1990  E8 1682 R             4686     C          CALL    S21                             ; DOUBLE UP ALL THE BITS
1993  23 C3                 4687     C          AND     AX,BX                           ; CONVERT THEM TO FORE-
                            4688     C                                                  ;  GROUND COLOR (0 BACK)
1995  F6 C2 80              4689     C          TEST    DL,80H                          ; IS THIS XOR FUNCTION
1998  74 07                 4690     C          JZ      S10                             ; NO, STORE IT IN AS IT IS
199A  26: 32 25             4691     C          XOR     AH,ES:[DI]                      ; DO FUNCTION WITH HALF
199D  26: 32 45 01          4692     C          XOR     AL,ES:[DI+1]                    ;  AND WITH OTHER HALF
19A1                        4693     C  S10:
19A1  26: 88 25             4694     C          MOV     ES:[DI],AH                      ; STORE FIRST BYTE
19A4  26: 88 45 01          4695     C          MOV     ES:[DI+1],AL                    ; STORE SECOND BYTE
19A8  AC                    4696     C          LODSB                                   ; GET CODE POINT
19A9  E8 1682 R             4697     C          CALL    S21
19AC  23 C3                 4698     C          AND     AX,BX                           ; CONVERT TO COLOR
19AE  F6 C2 80              4699     C          TEST    DL,80H                          ; IS THIS XOR FUNCTION
19B1  74 0A                 4700     C          JZ      S11                             ; NO, JUST STORE THE VALUE
19B3  26: 32 A5 2000        4701     C          XOR     AH,ES:[DI+2000H]                ; FUNCTION WITH FIRST HALF
19B8  26: 32 85 2001        4702     C          XOR     AL,ES:[DI+2001H]                ; AND WITH SECOND HALF
19BD                        4703     C  S11:
19BD  26: 88 A5 2000        4704     C          MOV     ES:[DI+2000H],AH
19C2  26: 88 85 2001        4705     C          MOV     ES:[DI+2000H+1],AL              ; STORE IN SECOND PORTION
19C7  83 C7 50              4706     C          ADD     DI,80                           ; POINT TO NEXT LOCATION
19CA  FE CE                 4707     C          DEC     DH
19CC  75 C1                 4708     C          JNZ     S9                              ; KEEP GOING
19CE  5E                    4709     C          POP     SI                              ; RECOVER CODE PONTER
19CF  5F                    4710     C          POP     DI                              ; RECOVER REGEN POINTER
19D0  47                    4711     C          INC     DI                              ; POINT TO NEXT CHAR
19D1  47                    4712     C          INC     DI
19D2  E2 B7                 4713     C          LOOP    S8                              ; MORE TO WRITE
19D4  E9 219E R             4714     C          JMP     V_RET
19D7                        4715     C  GRAPHICS_WRITE ENDP
                            4716     C
                            4717     C  ;--------------------------------------------------------------------
                            4718     C  ; ENTRY                                                             :
                            4719     C  ;       AL = CHAR TO WRITE                                          :
                            4720     C  ;       BH = DISPLAY PAGE                                           :
                            4721     C  ;       BL = ATTRIBUTE/COLOR                                        :
                            4722     C  ;       CX = COUNT OF CHARS TO WRITE                                :
                            4723     C  ;--------------------------------------------------------------------
19D7                        4724     C  GRX_WRT PROC    NEAR
                            4725     C          ASSUME  DS:ABS0,ES:NOTHING
19D7  80 FC 0F              4726     C          CMP     AH,0FH                          ; 640X350 GRAPHICS
19DA  72 0E                 4727     C          JB      NO_ADJ1
19DC  E8 14F7 R             4728     C          CALL    MEM_DET                         ; BASE CARD
19DF  72 09                 4729     C          JC      NO_ADJ1
19E1  80 E3 85              4730     C          AND     BL,10000101B                    ; 85H, XOR C2 C0 MASK
19E4  8A E3                 4731     C          MOV     AH,BL
19E6  D0 E4                 4732     C          SHL     AH,1                            ; EXPAND C0 TO C1, C2 TO C3
19E8  0A DC                 4733     C          OR      BL,AH                           ; BUILD ?(80H) * (0,3,C,F)
19EA                        4734     C  NO_ADJ1:
19EA  2A E4                 4735     C          SUB     AH,AH                           ; ZERO
19EC  F7 26 0485 R          4736     C          MUL     POINTS                          ; OFFSET FONT TABLE BASE
19F0  50                    4737     C          PUSH    AX                              ; FONT TABLE DISPLACEMENT
19F1  E8 16BA R             4738     C          CALL    GR_CUR                          ; GET OFFSET INTO REGEN
19F4  8B F8                 4739     C          MOV     DI,AX                           ;  INTO DESTINATION
19F6  8B 2E 0485 R          4740     C          MOV     BP,POINTS                       ; BYTES PER CHAR
                            4741     C          SRLOAD  ES,0A000H                       ; REGEN SEGEMNT
19FA  BA A000               4742     C+          MOV     DX,0A000H
19FD  8E C2                 4743     C+          MOV     ES,DX
19FF  C5 36 010C R          4744     C          LDS     SI,GRX_SET                      ; ADDRESSING TO FONTS
1A03  58                    4745     C          POP     AX                              ; RECOVER OFFSET
1A04  03 F0                 4746     C          ADD     SI,AX                           ; CHARACTER IN TABLE
1A06  B6 03                 4747     C          MOV     DH,3
1A08                        4748     C  S20A:
1A08  F6 C3 80              4749     C          TEST    BL,080H                         ; TEST FOR XOR
1A0B  74 0B                 4750     C          JZ      NO_XOR                          ; NO XOR
1A0D  B2 CE                 4751     C          MOV     DL,GRAPH_ADDR
1A0F  B8 0318               4752     C          MOV     AX,0318H                        ; GRAPHICS CHIP XOR
1A12  E8 0D15 R             4753     C          CALL    OUT_DX                          ; SET REGISTER
1A15  EB 1E 90              4754     C          JMP     F_2                             ; SKIP BLANK
1A18                        4755     C  NO_XOR:                                         ; BLANK BOX FOR CHAR
1A18  57                    4756     C          PUSH    DI                              ; SAVE REGEN POINTER
1A19  B2 C4                 4757     C          MOV     DL,SEQ_ADDR
1A1B  B8 020F               4758     C          MOV     AX,020FH                        ; ENABLE ALL MAPS
1A1E  E8 0D15 R             4759     C          CALL    OUT_DX
1A21  2B C0                 4760     C          SUB     AX,AX                           ; STORE ZERO
1A23  51                    4761     C          PUSH    CX                              ; SAVE CHARACTER COUNT
1A24  8B CD                 4762     C          MOV     CX,BP                           ; GET BYTE COUNT
1A26  1E                    4763     C          PUSH    DS
1A27  E8 0CFE R             4764     C          CALL    DDS
1A2A                        4765     C  S13A:
1A2A  AA                    4766     C          STOSB                                   ; ZERO REGEN BYTE
1A2B  03 3E 044A R          4767     C          ADD     DI,CRT_COLS                     ; NEXT BYTE OF BOX
1A2F  4F                    4768     C          DEC     DI                              ; ADJUST
1A30  E2 F8                 4769     C          LOOP    S13A                            ; NEXT BYTE
1A32  1F                    4770     C          POP     DS
1A33  59                    4771     C          POP     CX                              ; RECOVER CHARACTER COUNT
1A34  5F                    4772     C          POP     DI                              ; RECOVER REGEN POINTER
1A35                        4773     C  F_2:
1A35  B2 C4                 4774     C          MOV     DL,SEQ_ADDR
1A37  B4 02                 4775     C          MOV     AH,02H                          ; SET MAP MASK
1A39  8A C3                 4776     C          MOV     AL,BL                           ;  FOR COLOR
1A3B  E8 0D15 R             4777     C          CALL    OUT_DX                          ; SET THE CHIP
1A3E  57                    4778     C          PUSH    DI                              ; SAVE OFFSET IN REGEN
1A3F  53                    4779     C          PUSH    BX                              ; SAVE COLOR VALUE
1A40  51                    4780     C          PUSH    CX                              ; SAVE CHACTER COUNT
1A41  8B DD                 4781     C          MOV     BX,BP                           ; LOOP CONTROL, BYTES/CHAR
1A43  1E                    4782     C          PUSH    DS                              ; SAVE FONT SEGMENT
1A44  E8 0CFE R             4783     C          CALL    DDS                             ; SET LOW RAM SEGMENT
                            4784     C          ASSUME  DS:ABS0
1A47  8B 0E 044A R          4785     C          MOV     CX,CRT_COLS                     ; GET COLUMN COUNT
1A4B  1F                    4786     C          POP     DS                              ; RESTORE FONT SEGMENT
                            4787     C          ASSUME  DS:NOTHING
1A4C                        4788     C  S1K:                                            ; WRITE OUT THE CHARACTER
```

```
1A4C  8A 04                4789  C          MOV     AL,DS:[SI]                      ; CODE POINT
1A4E  26: 8A 25            4790  C          MOV     AH,ES:[DI]                      ; LATCH DATA
1A51  26: 88 05            4791  C          MOV     ES:[DI],AL                      ; WRITE ONE BYTE OF FONT
1A54  46                   4792  C          INC     SI                              ; NEXT FONT POINT
1A55  03 F9                4793  C          ADD     DI,CX                           ; ONE ROW BELOW LAST POINT
1A57  4B                   4794  C          DEC     BX                              ; BYTES PER CHAR COUNTER
1A58  75 F2                4795  C          JNZ     S1K                             ; DO NEXT ROW OF CHARACTER
                           4796  C
1A5A  59                   4797  C          POP     CX                              ; CHARACTER COUNT
1A5B  5B                   4798  C          POP     BX                              ; COLOR VALUE
1A5C  2B F5                4799  C          SUB     SI,BP                           ; ADJUST PTR TO FONT TABLE
1A5E  5F                   4800  C          POP     DI                              ; REGEN POINTER
1A5F  47                   4801  C          INC     DI                              ; NEXT CHAR POSN IN REGEN
1A60  E2 A6                4802  C          LOOP    S20A                            ; WRITE ANOTHER CHARACTER
                           4803  C
1A62  B2 CE                4804  C          MOV     DL,GRAPH_ADDR
1A64  B8 0300              4805  C          MOV     AX,0300H                        ; NORMAL WRITE, NO ROTATE
1A67  E8 0D15 R            4806  C          CALL    OUT_DX                          ; SET THE CHIP
1A6A  B2 C4                4807  C          MOV     DL,SEQ_ADDR
1A6C  B8 020F              4808  C          MOV     AX,020FH                        ; ENABLE ALL MAPS
1A6F  E8 0D15 R            4809  C          CALL    OUT_DX                          ; SET THE CHIP
1A72  E9 219E R            4810  C          JMP     V_RET
1A75                       4811  C  GRX_WRT ENDP
                           4812  C
                           4813  C          SUBTTL
                           4814
                           4815       ;----- SET COLOR PALETTE
                           4816
1A75                       4817       AHB:
                           4818               ASSUME DS:ABS0
1A75  80 3E 0463 R B4      4819               CMP     BYTE PTR ADDR_6845,0B4H
1A7A  74 09                4820               JE      M21_B                           ; CALL VALID ONLY FOR COLOR
1A7C  F6 06 0487 R 02      4821               TEST    INFO,2                          ; SEE IF TS THE OLD COLOR CARD
1A81  74 05                4822               JZ      M21_A                           ; IF NOT, HANDLE IT HERE
1A83  CD 42                4823               INT     42H                             ; OLD CODE CALL
1A85                       4824       M21_B:
1A85  E9 219E R            4825               JMP     V_RET                           ; BACK TO CALLER
1A88                       4826       M21_A:
1A88  2B C0                4827               SUB     AX,AX
1A8A  8B E8                4828               MOV     BP,AX
1A8C  C4 3E 04A8 R         4829               LES     DI,SAVE_PTR
1A90  83 C7 04             4830               ADD     DI,4
1A93  26: C4 3D            4831               LES     DI,DWORD PTR ES:[DI]
1A96  8C C0                4832               MOV     AX,ES
1A98  0B C7                4833               OR      AX,DI
1A9A  74 01                4834               JZ      NOTHAHB
1A9C  45                   4835               INC     BP
1A9D                       4836       NOTHAHB:
1A9D  E8 1DC0 R            4837               CALL    PAL_INIT
1AA0  0A FF                4838               OR      BH,BH
1AA2  75 65                4839               JNZ     M20
                           4840
                           4841       ;----- HANDLE BH = 0 HERE
                           4842       ;       ALPHA MODES  => BL = OVERSCAN COLOR
                           4843       ;       GRAPHICS     => BL = OVERSCAN AND BACKGROUND COLOR
                           4844
                           4845       ;----- MOVE INTENSITY BIT FROM D3 TO D4 FOR COMPATIBILITY
                           4846
1AA4  8A FB                4847               MOV     BH,BL
1AA6  A0 0466 R            4848               MOV     AL,CRT_PALETTE
1AA9  24 E0                4849               AND     AL,0E0H
1AAB  80 E3 1F             4850               AND     BL,01FH
1AAE  0A C3                4851               OR      AL,BL
1AB0  A2 0466 R            4852               MOV     CRT_PALETTE,AL
1AB3  8A DF                4853               MOV     BL,BH
1AB5  80 E7 08             4854               AND     BH,08H
1AB8  D0 E7                4855               SHL     BH,1
1ABA  8A E8                4856               MOV     CH,AL
1ABC  80 E5 EF             4857               AND     CH,0EFH
1ABF  0A ED                4858               OR      CH,CH
1AC1  80 E3 0F             4859               AND     BL,0FH
1AC4  8A FB                4860               MOV     BH,BL
1AC6  D0 E3                4861               SHL     BL,1
1AC8  80 E3 10             4862               AND     BL,0010H
1ACB  80 E7 07             4863               AND     BH,07H
1ACE  0A DF                4864               OR      BL,BH
                           4865
1AD0  A0 0449 R            4866               MOV     AL,CRT_MODE
1AD3  3C 03                4867               CMP     AL,3
1AD5  76 0E                4868               JBE     M21
                           4869
                           4870       ;----- GRAPHICS MODE DONE HERE (SET PALETTE 0 AND OVERSCAN)
                           4871
1AD7  B4 00                4872               MOV     AH,0
1AD9  8A C3                4873               MOV     AL,BL
1ADB  E8 1D9F R            4874               CALL    PAL_SET
                           4875
1ADE  0B ED                4876               OR      BP,BP
1AE0  74 03                4877               JZ      M21
1AE2  26: 88 1D            4878               MOV     ES:[DI],BL
                           4879
                           4880       ;----- ALPHA MODE DONE HERE (SET OVERSCAN REGISTER)
                           4881
1AE5                       4882       M21:
1AE5  80 3E 0449 R 03      4883               CMP     CRT_MODE,3                      ; CHECK FOR AN ENHANCED MODE
1AEA  77 05                4884               JA      SET_OVRSC                       ; NO CHANCE
1AEC  E8 0E9A R            4885               CALL    BRST_DET                        ; SEE IF WE ARE ENHANCED
1AEF  72 07                4886               JC      SKIP_OVRSC                      ; THERE IS NO BORDER
1AF1                       4887       SET_OVRSC:
1AF1  B4 11                4888               MOV     AH,011H                         ; OVERSCAN REGISTER
1AF3  8A C3                4889               MOV     AL,BL
1AF5  E8 1D9F R            4890               CALL    PAL_SET                         ; SET THE BORDER
1AF8                       4891       SKIP_OVRSC:
1AF8  0B ED                4892               OR      BP,BP
1AFA  74 04                4893               JZ      M21Y
1AFC  26: 88 5D 10         4894               MOV     ES:[DI][16D],BL
1B00                       4895       M21Y:
1B00  8A DD                4896               MOV     BL,CH
1B02  80 E3 20             4897               AND     BL,0020H
1B05  B1 05                4898               MOV     CL,5
1B07  D2 EB                4899               SHR     BL,CL
                           4900
                           4901       ;----- HANDLE BH = 1 HERE
                           4902       ;       ALPHA MODES  => NO EFFECT
                           4903       ;       GRAPHICS     => LOW BIT OF BL = 0
                           4904       ;                       PALETTE 0 = BACKGROUND
                           4905       ;                       PALETTE 1 = GREEN
                           4906       ;                       PALETTE 2 = RED
                           4907       ;                       PALETTE 3 = BROWN
                           4908       ;                    => LOW BIT OF BL = 1
                           4909       ;                       PALETTE 0 = BACKGROUND
                           4910       ;                       PALETTE 1 = CYAN
                           4911       ;                       PALETTE 2 = MAGENTA
                           4912       ;                       PALETTE 3 = WHITE
                           4913       ;
                           4914
```

```
1B09                    4915        M20:
1B09  80 3E 0449 R 03   4916                CMP     CRT_MODE,3
1B0E  76 4A             4917                JBE     M80
                        4918
1B10  A0 0466 R         4919                MOV     AL,CRT_PALETTE
1B13  24 DF             4920                AND     AL,0DFH
1B15  80 E3 01          4921                AND     BL,1
1B18  74 02             4922                JZ      M22
1B1A  0C 20             4923                OR      AL,020H
1B1C                    4924        M22:
1B1C  A2 0466 R         4925                MOV     CRT_PALETTE,AL
1B1F  24 10             4926                AND     AL,010H
1B21  0C 02             4927                OR      AL,2
1B23  0A D8             4928                OR      BL,AL
1B25  B4 01             4929                MOV     AH,1
1B27  8A C3             4930                MOV     AL,BL
1B29  E8 1D9F R         4931                CALL    PAL_SET
                        4932
1B2C  0B ED             4933                OR      BP,BP
1B2E  74 04             4934                JZ      M22Y
1B30  26: 88 5D 01      4935                MOV     ES:[DI][1],BL
1B34                    4936        M22Y:
                        4937
1B34  FE C3             4938                INC     BL
1B36  FE C3             4939                INC     BL
1B38  B4 02             4940                MOV     AH,2
1B3A  8A C3             4941                MOV     AL,BL
1B3C  E8 1D9F R         4942                CALL    PAL_SET
                        4943
1B3F  0B ED             4944                OR      BP,BP
1B41  74 04             4945                JZ      M27Y
1B43  26: 88 5D 02      4946                MOV     ES:[DI][2],BL
1B47                    4947        M27Y:
                        4948
1B47  FE C3             4949                INC     BL
1B49  FE C3             4950                INC     BL
1B4B  B4 03             4951                MOV     AH,3
1B4D  8A C3             4952                MOV     AL,BL
1B4F  E8 1D9F R         4953                CALL    PAL_SET
                        4954
1B52  0B ED             4955                OR      BP,BP
1B54  74 04             4956                JZ      M80
1B56  26: 88 5D 03      4957                MOV     ES:[DI][3],BL
                        4958
1B5A                    4959        M80:
1B5A  E8 1DB7 R         4960                CALL    PAL_ON
1B5D  E9 219E R         4961                JMP     V_RET
                        4962
                        4963    C           INCLUDE         VDOT.INC
                        4964    C           SUBTTL  VDOT.INC
                        4965    C           PAGE
                        4966    C   ;-----------------------------------------------
                        4967    C   ; ENTRY                                       :
                        4968    C   ;       DX = ROW                              :
                        4969    C   ;       CX = COLUMN                           :
                        4970    C   ;       BH = PAGE                             :
                        4971    C   ; EXIT                                        :
                        4972    C   ;       BX = OFFSET INTO REGEN                :
                        4973    C   ;       AL = BIT MASK FOR COLUMN BYTE         :
                        4974    C   ;-----------------------------------------------
1B60                    4975    C   DOT_SUP_1       PROC    NEAR
                        4976    C
                        4977    C   ;----- OFFSET = PAGE OFFSET ROW * BYTES/ROW * COLUMN/8
                        4978    C
1B60  F7 26 044A R      4979    C           MUL     WORD PTR CRT_COLS           ; ROW * BYTES/ROW
1B64  51                4980    C           PUSH    CX                          ; SAVE COLUMN VALUE
1B65  D1 E9             4981    C           SHR     CX,1                        ; DIVIDE BY EIGHT TO
1B67  D1 E9             4982    C           SHR     CX,1                        ; DETERMINE THE BYTE THAT
1B69  D1 E9             4983    C           SHR     CX,1                        ; THIS DOT IS IN
                        4984    C                                               ;  (8 BITS/BYTE)
1B6B  03 C1             4985    C           ADD     AX,CX                       ; BYTE OFFSET INTO PAGE
1B6D  8A DF             4986    C           MOV     BL,BH                       ; GET PAGE INTO BL
1B6F  2A FF             4987    C           SUB     BH,BH                       ; ZERO
1B71  8B CB             4988    C           MOV     CX,BX                       ; COUNT VALUE
1B73  8B 1E 044C R      4989    C           MOV     BX,CRT_LEN                  ; LENGTH OF ONE PAGE
1B77  E3 04             4990    C           JCXZ    DS_2                        ; PAGE ZERO
1B79                    4991    C   DS_3:
1B79  03 C3             4992    C           ADD     AX,BX                       ; BUMP TO NEXT PAGE
1B7B  E2 FC             4993    C           LOOP    DS_3                        ; DO FOR THE REST
1B7D                    4994    C   DS_2:
1B7D  59                4995    C           POP     CX                          ; RECOVER COLUMN VALUE
1B7E  8B D8             4996    C           MOV     BX,AX                       ; REGEN OFFSET
1B80  80 E1 07          4997    C           AND     CL,07H                      ; SHIFT COUNT FOR BIT MASK
1B83  B0 80             4998    C           MOV     AL,080H                     ; MASK BIT
1B85  D2 E8             4999    C           SHR     AL,CL                       ; POSITION MASK BIT
1B87  C3                5000    C           RET
1B88                    5001    C   DOT_SUP_1       ENDP
                        5002    C
                        5003    C   ;-------------------------------------------------------
                        5004    C   ; THIS SUBROUTINE DETERMINES THE REGEN BYTE LOCATION    :
                        5005    C   ; OF THE INDICATED ROW COLUMN VALUE IN GRAPHICS MODE.   :
                        5006    C   ; ENTRY --                                            :
                        5007    C   ;  DX = ROW VALUE (0-199)                             :
                        5008    C   ;  CX = COLUMN VALUE (0-639)                          :
                        5009    C   ; EXIT --                                             :
                        5010    C   ;  SI = OFFSET INTO REGEN BUFFER FOR BYTE OF INTEREST  :
                        5011    C   ;  AH = MASK TO STRIP OFF THE BITS OF INTEREST         :
                        5012    C   ;  CL = BITS TO SHIFT TO RIGHT JUSTIFY THE MASK IN AH  :
                        5013    C   ;  DH = BITS IN RESULT                                :
                        5014    C   ;-------------------------------------------------------
1B88                    5015    C   R3      PROC    NEAR
1B88  53                5016    C           PUSH    BX                      ; SAVE BX DURING OPERATION
1B89  50                5017    C           PUSH    AX                      ; WILL SAVE AL DURING OPERATION
                        5018    C
                        5019    C   ;----- DETERMINE 1ST BYTE IN IDICATED ROW BY MULTIPLYING ROW VALUE BY 40
                        5020    C   ;-----  ( LOW BIT OF ROW DETERMINES EVEN/ODD, 80 BYTES/ROW
                        5021    C
1B8A  B0 28             5022    C           MOV     AL,40
1B8C  52                5023    C           PUSH    DX                      ; SAVE ROW VALUE
1B8D  80 E2 FE          5024    C           AND     DL,0FEH                 ; STRIP OFF ODD/EVEN BIT
1B90  F6 E2             5025    C           MUL     DL                      ; AX HAS ADDRESS OF 1ST BYTE
                        5026    C                                           ;  OF INDICATED ROW
1B92  5A                5027    C           POP     DX                      ; RECOVER IT
1B93  F6 C2 01          5028    C           TEST    DL,1                    ; TEST FOR EVEN/ODD
1B96  74 03             5029    C           JZ      R4                      ; JUMP IF EVEN ROW
1B98  05 2000           5030    C           ADD     AX,2000H                ; OFFSET TO LOCATION OF ODD ROWS
1B9B                    5031    C   R4:                                     ; EVEN_ROW
1B9B  8B F0             5032    C           MOV     SI,AX                   ; MOVE POINTER TO SI
1B9D  58                5033    C           POP     AX                      ; RECOVER AL VALUE
1B9E  8B D1             5034    C           MOV     DX,CX                   ; COLUMN VALUE TO DX
                        5035    C
                        5036    C   ;----- DETERMINE GRAPHICS MODE CURRENTLY IN EFFECT
                        5037    C
                        5038    C   ;-------------------------------------------------------------
                        5039    C   ; SET UP THE REGISTERS ACCORDING TO THE MODE                :
                        5040    C   ;  CH = MASK FOR LOW OF COLUMN ADDRESS ( 7/3 FOR HIGH/MED RES)  :
```

```
                        5041     C  ; CL = # ADDRESS BITS IN COLUMN VALUE ( 3/2 FOR H/M)          :
                        5042     C  ; BL = MASK TO SELECT BITS FROM POINTED BYTE (80H/C0H FOR H/M)  :
                        5043     C  ; BH = NUMBER OF VALID BITS IN POINTED BYTE ( 1/2 FOR H/M)     :
                        5044     C  ;-------------------------------------------------------------
                        5045     C
1BA0  BB 02C0           5046     C          MOV     BX,2C0H
1BA3  B9 0302           5047     C          MOV     CX,302H                 ; SET PARMS FOR MED RES
1BA6  80 3E 0449 R 06   5048     C          CMP     CRT_MODE,6
1BAB  72 06             5049     C          JC      R5                      ; HANDLE IF MED ARES
1BAD  BB 0180           5050     C          MOV     BX,180H
1BB0  B9 0703           5051     C          MOV     CX,703H                 ; SET PARMS FOR HIGH RES
                        5052     C
                        5053     C  ;----- DETERMINE BIT OFFSET IN BYTE FROM COLUMN MASK
                        5054     C
1BB3                    5055     C  R5:
1BB3  22 EA             5056     C          AND     CH,DL                   ; ADDRESS OF PEL WITHIN BYTE TO CH
                        5057     C
                        5058     C  ;----- DETERMINE BYTE OFFSET FOR THIS LOCATION IN COLUMN
                        5059     C
1BB5  D3 EA             5060     C          SHR     DX,CL                   ; SHIFT BY CORRECT AMOUNT
1BB7  03 F2             5061     C          ADD     SI,DX                   ; INCREMENT THE POINTER
1BB9  8A F7             5062     C          MOV     DH,BH                   ; GET THE # OF BITS IN RESULT TO DH
                        5063     C
                        5064     C  ;----- MULTIPLY BH (VALID BITS IN BYTE) BY CH (BIT OFFSET)
                        5065     C
1BBB  2A C9             5066     C          SUB     CL,CL                   ; ZERO INTO STORAGE LOCATION
1BBD                    5067     C  R6:
1BBD  D0 C8             5068     C          ROR     AL,1                    ; LEFT JUSTIFY THE VALUE
                        5069     C                                          ;  IN AL (FOR WRITE)
1BBF  02 CD             5070     C          ADD     CL,CH                   ; ADD IN THE BIT OFFSET VALUE
1BC1  FE CF             5071     C          DEC     BH                      ; LOOP CONTROL
1BC3  75 F8             5072     C          JNZ     R6                      ; ON EXIT, CL HAS SHIFT COUNT
                        5073     C                                          ;  TO RESTORE BITS
1BC5  8A E3             5074     C          MOV     AH,BL                   ; GET MASK TO AH
1BC7  D2 EC             5075     C          SHR     AH,CL                   ; MOVE THE MASK TO CORRECT LOCATION
1BC9  5B                5076     C          POP     BX                      ; RECOVER REG
1BCA  C3                5077     C          RET                             ; RETURN WITH EVERYTHING SET UP
1BCB                    5078     C  R3      ENDP
                        5079     C
                        5080     C  ;-------------------------------------------------------------
                        5081     C  ; READ DOT -- WRITE DOT                                       :
                        5082     C  ;       THESE ROUTINES WILL WRITE A DOT, OR READ THE DOT AT    :
                        5083     C  ;       THE INDICATED LOCATION                                :
                        5084     C  ; ENTRY --                                                    :
                        5085     C  ;   DX = ROW (0-199)     (THE ACTUAL VALUE DEPENDS ON THE MODE)  :
                        5086     C  ;   CX = COLUMN ( 0-639) ( THE VALUES ARE NOT RANGE CHECKED )  :
                        5087     C  ;   AL = DOT VALUE TO WRITE (1,2 OR 4 BITS DEPENDING ON MODE,  :
                        5088     C  ;       REQD FOR WRITE DOT ONLY, RIGHT JUSTIFIED)             :
                        5089     C  ;       BIT 7 OF AL=1 INDICATES XOR THE VALUE INTO THE LOCATION :
                        5090     C  ; DS = DATA SEGMENT                                           :
                        5091     C  ; ES = REGEN SEGMENT                                          :
                        5092     C  ;                                                             :
                        5093     C  ; EXIT                                                        :
                        5094     C  ;       AL = DOT VALUE READ, RIGHT JUSTIFIED, READ ONLY       :
                        5095     C  ;-------------------------------------------------------------
                        5096     C
                        5097     C  ;----- WRITE DOT
                        5098     C
1BCB                    5099     C  AHC:
                        5100     C          ASSUME  DS:ABS0
1BCB  80 3E 0449 R 07   5101     C          CMP     CRT_MODE,7
1BD0  77 2A             5102     C          JA      WRITE_DOT_2
                        5103     C
1BD2                    5104     C  WRITE_DOT       PROC    NEAR
                        5105     C          ASSUME  DS:ABS0,ES:NOTHING
1BD2  52                5106     C          PUSH    DX
                        5107     C          SRLOAD  ES,0B800H
1BD3  BA B800           5108     C+          MOV     DX,0B800H
1BD6  8E C2             5109     C+          MOV     ES,DX
1BD8  5A                5110     C          POP     DX
1BD9  50                5111     C          PUSH    AX                      ; SAVE DOT VALUE
1BDA  50                5112     C          PUSH    AX                      ;  TWICE
1BDB  E8 1B88 R         5113     C          CALL    R3                      ; DETERMINE BYTE POSITION OF THE DOT
1BDE  D2 E8             5114     C          SHR     AL,CL                   ; SHIFT TO SET UP THE BITS FOR OUTPUT
1BE0  22 C4             5115     C          AND     AL,AH                   ; STRIP OFF THE OTHER BITS
1BE2  26: 8A 0C         5116     C          MOV     CL,ES:[SI]              ; GET THE CURRENT BYTE
1BE5  5B                5117     C          POP     BX                      ; RECOVER XOR FLAG
1BE6  F6 C3 80          5118     C          TEST    BL,80H                  ; IS IT ON
1BE9  75 0D             5119     C          JNZ     R2                      ; YES, XOR THE DOT
1BEB  F6 D4             5120     C          NOT     AH                      ; SET THE MASK TO REMOVE THE
1BED  22 CC             5121     C          AND     CL,AH                   ;  INDICATED BITS
1BEF  0A C1             5122     C          OR      AL,CL                   ; OR IN THE NEW VALUE OF THOSE BITS
1BF1                    5123     C  R1:                                     ; FINISH_DOT
1BF1  26: 88 04         5124     C          MOV     ES:[SI],AL              ; RESTORE THE BYTE IN MEMORY
1BF4  58                5125     C          POP     AX
1BF5  E9 219E R         5126     C          JMP     V_RET
1BF8                    5127     C  R2:                                     ; XOR_DOT
1BF8  32 C1             5128     C          XOR     AL,CL                   ; EXCLUSIVE OR THE DOTS
1BFA  EB F5             5129     C          JMP     R1                      ; FINISH UP THE WRITING
1BFC                    5130     C  WRITE_DOT       ENDP
                        5131     C
1BFC                    5132     C  WRITE_DOT_2     PROC    NEAR
1BFC  80 3E 0449 R 0F   5133     C          CMP     CRT_MODE,0FH
1C01  72 0D             5134     C          JB      NO_ADJ2
1C03  E8 14F7 R         5135     C          CALL    MEM_DET                         ; BASE CARD
1C06  72 08             5136     C          JC      NO_ADJ2
1C08  24 85             5137     C          AND     AL,10000101B                    ; 85H, XOR C2 C0 MASK
1C0A  8A E0             5138     C          MOV     AH,AL
1C0C  D0 E4             5139     C          SHL     AH,1                            ; EXPAND C0 TO C1, C2 TO C3
1C0E  0A C4             5140     C          OR      AL,AH                           ; BUILD ?(80H) + (0,3,C,F)
1C10                    5141     C  NO_ADJ2:
1C10  50                5142     C          PUSH    AX
1C11  8B C2             5143     C          MOV     AX,DX                           ; ROW VALUE
1C13  E8 1B60 R         5144     C          CALL    DOT_SUP_1                       ; BX=OFFSET,AL=BIT MASK
1C16  B6 03             5145     C          MOV     DH,3
1C18  B2 CE             5146     C          MOV     DL,GRAPH_ADDR                   ; GRAPHICS CHIP
1C1A  B4 08             5147     C          MOV     AH,G_BIT_MASK                   ; BIT MASK REGISTER
1C1C  E8 0D15 R         5148     C          CALL    OUT_DX                          ; SET BIT MASK
1C1F  52                5149     C          PUSH    DX
                        5150     C          SRLOAD  ES,0A000H                       ; REGEN SEGMENT
1C20  BA A000           5151     C+          MOV     DX,0A000H
1C23  8E C2             5152     C+          MOV     ES,DX
1C25  5A                5153     C          POP     DX
1C26  58                5154     C          POP     AX                              ; RECOVER COLOR
1C27  8A E8             5155     C          MOV     CH,AL                           ; SAVE COLOR
1C29  F6 C5 80          5156     C          TEST    CH,080H                         ; SEE IF XOR
1C2C  74 0A             5157     C          JZ      WD_A                            ; NO XOR
1C2E  B4 03             5158     C          MOV     AH,G_DATA_ROT                   ; DO XOR
1C30  B0 18             5159     C          MOV     AL,018H                         ; XOR FUNCTION
1C32  E8 0D15 R         5160     C          CALL    OUT_DX                          ; SET THE REGISTER
1C35  EB 12 90          5161     C          JMP     WD_B                            ; SKIP THE BLANK
1C38                    5162     C  WD_A:                                           ; BLANK THE DOT
1C38  B2 C4             5163     C          MOV     DL,SEQ_ADDR                     ; SEQUENCER
1C3A  B4 02             5164     C          MOV     AH,S_MAP                        ; MAP MASK
1C3C  B0 FF             5165     C          MOV     AL,0FFH                         ; ENABLE ALL MAPS
1C3E  E8 0D15 R         5166     C          CALL    OUT_DX                          ; SET THE REGISTER
```

```
1C41  26: 8A 07          5167     C          MOV     AL,ES:[BX]                      ; LATCH DATA
1C44  2A C0              5168     C          SUB     AL,AL                           ; ZERO
1C46  26: 88 07          5169     C          MOV     ES:[BX],AL                      ; BLANK THE DOT
1C49                     5170     C  WD_B:                                           ; SET THE COLOR MAP MASK
1C49  B2 C4              5171     C          MOV     DL,SEQ_ADDR                     ; SEQUENCER
1C4B  B4 02              5172     C          MOV     AH,S_MAP                        ; MAP MASK REGISTER
1C4D  8A C5              5173     C          MOV     AL,CH                           ; COLOR VALUE
1C4F  24 0F              5174     C          AND     AL,0FH                          ; VALUES 0-15
1C51  E8 0D15 R          5175     C          CALL    OUT_DX                          ; SET IT
1C54  26: 8A 07          5176     C          MOV     AL,ES:[BX]                      ; LATCH DATA
1C57  B0 FF              5177     C          MOV     AL,0FFH                         ; WRITE VALUE
1C59  26: 88 07          5178     C          MOV     ES:[BX],AL                      ; SET THE DOT
                         5179     C
                         5180     C  ;----- NORMALIZE THE ENVIRONMENT
                         5181     C
1C5C  E8 0D15 R          5182     C          CALL    OUT_DX                          ; ALL MAPS ON
1C5F  B2 CE              5183     C          MOV     DL,GRAPH_ADDR                   ; GRAPHICS CHIPS
1C61  B4 03              5184     C          MOV     AH,G_DATA_ROT                   ; XOR REGISTER
1C63  2A C0              5185     C          SUB     AL,AL                           ; NORMAL WRITES
1C65  E8 0D15 R          5186     C          CALL    OUT_DX                          ; SET IT
1C68  B4 08              5187     C          MOV     AH,G_BIT_MASK                   ; BIT MASK
1C6A  B0 FF              5188     C          MOV     AL,0FFH                         ; ALL BITS ON
1C6C  E8 0D15 R          5189     C          CALL    OUT_DX                          ; SET IT
1C6F  E9 219E R          5190     C          JMP     V_RET                           ; WRITE DOT DONE
1C72                     5191     C  WRITE_DOT_2     ENDP
                         5192     C
1C72                     5193     C  RD_S    PROC    NEAR
                         5194     C          ASSUME  DS:ABS0
1C72  50                 5195     C          PUSH    AX
1C73  52                 5196     C          PUSH    DX
                         5197     C          SRLOAD  ES,0A000H
1C74  BA A000            5198     C+          MOV     DX,0A000H
1C77  8E C2              5199     C+          MOV     ES,DX
1C79  5A                 5200     C          POP     DX
1C7A  58                 5201     C          POP     AX
1C7B  8B C2              5202     C          MOV     AX,DX
1C7D  E8 1B60 R          5203     C          CALL    DOT_SUP_1
1C80  B5 07              5204     C          MOV     CH,7
1C82  2A E9              5205     C          SUB     CH,CL
1C84  2B D2              5206     C          SUB     DX,DX
1C86  B0 00              5207     C          MOV     AL,0
1C88  C3                 5208     C          RET
1C89                     5209     C  RD_S    ENDP
                         5210     C
1C89                     5211     C  RD_1S   PROC    NEAR
1C89  8A CD              5212     C          MOV     CL,CH
1C8B  B4 04              5213     C          MOV     AH,4
1C8D  52                 5214     C          PUSH    DX
1C8E  B6 03              5215     C          MOV     DH,3
1C90  B2 CE              5216     C          MOV     DL,GRAPH_ADDR
1C92  E8 0D15 R          5217     C          CALL    OUT_DX
1C95  5A                 5218     C          POP     DX
1C96  26: 8A 27          5219     C          MOV     AH,ES:[BX]
1C99  D2 EC              5220     C          SHR     AH,CL
1C9B  80 E4 01           5221     C          AND     AH,1
1C9E  C3                 5222     C          RET
1C9F                     5223     C  RD_1S   ENDP
                         5224     C
                         5225     C  ;----- READ DOT
                         5226     C
1C9F                     5227     C  AHD:
                         5228     C          ASSUME  DS:ABS0
1C9F  80 3E 0449 R 07    5229     C          CMP     CRT_MODE,7
1CA4  77 18              5230     C          JA      R_1
                         5231     C
1CA6                     5232     C  READ_DOT        PROC    NEAR
                         5233     C          ASSUME  DS:ABS0,ES:NOTHING
1CA6  52                 5234     C          PUSH    DX
                         5235     C          SRLOAD  ES,0B800H
1CA7  BA B800            5236     C+          MOV     DX,0B800H
1CAA  8E C2              5237     C+          MOV     ES,DX
1CAC  5A                 5238     C          POP     DX
1CAD  E8 1B88 R          5239     C          CALL    R3                      ; DETERMINE BYTE POSITION OF DOT
1CB0  26: 8A 04          5240     C          MOV     AL,ES:[SI]              ; GET THE BYTE
1CB3  22 C4              5241     C          AND     AL,AH                   ; MASK OFF THE OTHER BITS IN THE BYTE
1CB5  D2 E0              5242     C          SHL     AL,CL                   ; LEFT JUSTIFY THE VALUE
1CB7  8A CE              5243     C          MOV     CL,DH                   ; GET NUMBER OF BITS IN RESULT
1CB9  D2 C0              5244     C          ROL     AL,CL                   ; RIGHT JUSTIFY THE RESULT
1CBB  E9 219E R          5245     C          JMP     V_RET
1CBE                     5246     C  READ_DOT        ENDP
                         5247     C
1CBE                     5248     C  R_1:
1CBE  80 3E 0449 R 0F    5249     C          CMP     CRT_MODE,0FH
1CC3  72 25              5250     C          JB      READ_DOT_2
1CC5  E8 14F7 R          5251     C          CALL    MEM_DET
1CC8  72 20              5252     C          JC      READ_DOT_2
                         5253     C
1CCA                     5254     C  READ_DOT_1      PROC    NEAR                    ; 2 MAPS
                         5255     C          ASSUME  DS:ABS0,ES:NOTHING
1CCA  E8 1C72 R          5256     C          CALL    RD_S
1CCD  E8 1C89 R          5257     C          CALL    RD_1S
1CD0  0A D4              5258     C          OR      DL,AH
1CD2  D0 E4              5259     C          SHL     AH,1
1CD4  0A D4              5260     C          OR      DL,AH
1CD6  B0 02              5261     C          MOV     AL,2
1CD8  E8 1C89 R          5262     C          CALL    RD_1S
1CDB  D0 E4              5263     C          SHL     AH,1
1CDD  D0 E4              5264     C          SHL     AH,1
1CDF  0A D4              5265     C          OR      DL,AH
1CE1  D0 E4              5266     C          SHL     AH,1
1CE3  0A D4              5267     C          OR      DL,AH
1CE5  8A C2              5268     C          MOV     AL,DL
1CE7  E9 219E R          5269     C          JMP     V_RET
1CEA                     5270     C  READ_DOT_1      ENDP
                         5271     C
1CEA                     5272     C  READ_DOT_2      PROC    NEAR                    ; 4 MAPS
                         5273     C          ASSUME  DS:ABS0,ES:NOTHING
1CEA  E8 1C72 R          5274     C          CALL    RD_S
1CED                     5275     C  RD_2A:
1CED  E8 1C89 R          5276     C          CALL    RD_1S
1CF0  8A C8              5277     C          MOV     CL,AL
1CF2  D2 E4              5278     C          SHL     AH,CL
1CF4  0A D4              5279     C          OR      DL,AH
1CF6  FE C0              5280     C          INC     AL
1CF8  3C 03              5281     C          CMP     AL,3
1CFA  76 F1              5282     C          JBE     RD_2A
1CFC  8A C2              5283     C          MOV     AL,DL
1CFE  E9 219E R          5284     C          JMP     V_RET
1D01                     5285     C  READ_DOT_2      ENDP
                         5286     C
                         5287     C  ;--------------------------------------------------------------------------
                         5288     C  ; WRITE_TTY     WRITE TELETYPE TO ACTIVE PAGE                                :
                         5289     C  ;       THIS INTERFACE PROVIDES A TELETYPE LIKE INTERFACE TO THE VIDEO  :
                         5290     C  ;       CARD.   THE INPUT CHARACTER  IS WRITTEN TO THE  CURRENT CURSOR  :
                         5291     C  ;       POSITION, AND THE CURSOR IS MOVED TO THE NEXT POSITION. IF THE  :
                         5292     C  ;       CURSOR LEAVES THE LAST COLUMN OF THE FIELD,  THE COLUMN IS SET  :
```

```
                                5293     C  ;       TO ZERO,  AND THE ROW VALUE IS INCREMENTED.   IF THE ROW VALUE  :
                                5294     C  ;       LEAVES THE FIELD,  THE CURSOR IS PLACED ON THE LAST ROW, FIRST  :
                                5295     C  ;       COLUMN,  AND THE ENTIRE SCREEN IS SCROLLED UP ONE LINE.   WHEN  :
                                5296     C  ;       THE SCREEN IS SCROLLED UP, THE ATTRIBUTE FOR FILLING THE NEWLY  :
                                5297     C  ;       BLANKED LINE IS READ FROM THE  CURSOR POSITION ON THE PREVIOUS  :
                                5298     C  ;       LINE BEFORE THE SCROLL,  IN CHARACTER MODE.  IN GRAPHICS MODE,  :
                                5299     C  ;       THE 0 COLOR IS USED.                                            :
                                5300     C  ; ENTRY                                                                 :
                                5301     C  ;       (AH) = CURRENT CRT MODE                                         :
                                5302     C  ;       (AL) = CHARACTER TO BE WRITTEN                                  :
                                5303     C  ;        NOTE THAT BACK SPACE, CAR RET, BELL AND LINE FEED ARE HANDLED  :
                                5304     C  ;        AS COMMANDS RATHER THAN AS DISPLAYABLE GRAPHICS                :
                                5305     C  ;       (BL) = FOREGROUND COLOR FOR CHAR WRITE IF CURRENTLY IN A         :
                                5306     C  ;        GRAPHICS MODE                                                  :
                                5307     C  ; EXIT                                                                  :
                                5308     C  ;       ALL REGISTERS SAVED                                             :
                                5309     C  ;-------------------------------------------------------------------------
1D01                            5310     C  AHE:
                                5311     C          ASSUME CS:CODE,DS:ABS0
1D01  50                        5312     C          PUSH    AX                              ; SAVE REGISTERS
1D02  8A 3E 0462 R              5313     C          MOV     BH,ACTIVE_PAGE                  ; GET THE ACTIVE PAGE
1D06  53                        5314     C          PUSH    BX                              ; SAVE
1D07  8A DF                     5315     C          MOV     BL,BH                           ; GET PAGE TO BL
1D09  32 FF                     5316     C          XOR     BH,BH                           ; CLEAR HIGH BYTE
1D0B  D1 E3                     5317     C          SAL     BX,1                            ; *2 FOR WORD OFFSET
1D0D  8B 97 0450 R              5318     C          MOV     DX,[BX + OFFSET CURSOR_POSN]    ; CURSOR, ACTIVE PAGE
1D11  5B                        5319     C          POP     BX                              ; RECOVER
                                5320     C
                                5321     C  ;----- DX NOW HAS THE CURRENT CURSOR POSITION
                                5322     C
1D12  3C 0D                     5323     C          CMP     AL,0DH                          ; IS iT CARRIAGE RETURN
1D14  74 5C                     5324     C          JE      U9                              ; CAR_RET
1D16  3C 0A                     5325     C          CMP     AL,0AH                          ; IS IT A LINE FEED
1D18  74 5C                     5326     C          JE      U10                             ; LINE_FEED
1D1A  3C 08                     5327     C          CMP     AL,08H                          ; IS IT A BACKSPACE
1D1C  74 4C                     5328     C          JE      U8                              ; BACK_SPACE
1D1E  3C 07                     5329     C          CMP     AL,07H                          ; IS IT A BELL
1D20  74 5C                     5330     C          JE      U11                             ; BELL
                                5331     C
                                5332     C  ;----- WRITE THE CHAR TO THE SCREEN
                                5333     C
1D22  B4 0A                     5334     C          MOV     AH,10                           ; WRITE CHAR ONLY
1D24  B9 0001                   5335     C          MOV     CX,1                            ; ONLY ONE CHAR
1D27  CD 10                     5336     C          INT     10H                             ; WRITE THE CHAR
                                5337     C
                                5338     C  ;----- POSITION THE CURSOR FOR NEXT CHAR
                                5339     C
1D29  FE C2                     5340     C          INC     DL
1D2B  3A 16 044A R              5341     C          CMP     DL,BYTE PTR CRT_COLS            ; TEST FOR COLUMN OVERFLOW
1D2F  75 35                     5342     C          JNZ     U7                              ; SET_CURSOR
1D31  2A D2                     5343     C          SUB     DL,DL                           ; COLUMN FOR CURSOR
1D33  3A 36 0484 R              5344     C          CMP     DH,ROWS
1D37  75 2B                     5345     C          JNZ     U6                              ; SET_CURSOR_INC
                                5346     C
                                5347     C  ;----- SCROLL REQUIRED
                                5348     C
1D39                            5349     C  U1:
1D39  E8 115D R                 5350     C          CALL    SET_CPOS                        ; SET THE CURSOR
                                5351     C
                                5352     C  ;----- DETERMINE VALUE TO FILL WITH DURING SCROLL
                                5353     C
1D3C  A0 0449 R                 5354     C          MOV     AL,CRT_MODE                     ; GET THE CURRENT MODE
1D3F  3C 04                     5355     C          CMP     AL,4
1D41  72 06                     5356     C          JB      U2                              ; READ-CURSOR
1D43  2A FF                     5357     C          SUB     BH,BH                           ; FILL WITH BACKGROUND
1D45  3C 07                     5358     C          CMP     AL,7
1D47  75 06                     5359     C          JNE     U3                              ; SCROLL-UP
1D49                            5360     C  U2:                                             ; READ-CURSOR
1D49  B4 08                     5361     C          MOV     AH,8
1D4B  CD 10                     5362     C          INT     10H                             ; READ CHAR/ATTR
1D4D  8A FC                     5363     C          MOV     BH,AH                           ; STORE IN BH
1D4F                            5364     C  U3:                                             ; SCROLL-UP
1D4F  B8 0601                   5365     C          MOV     AX,601H                         ; SCROLL ONE LINE
1D52  2B C9                     5366     C          SUB     CX,CX                           ; UPPER LEFT CORNER
1D54  8A 36 0484 R              5367     C          MOV     DH,ROWS                         ; LOWER RIGHT ROW
1D58  8A 16 044A R              5368     C          MOV     DL,BYTE PTR CRT_COLS            ; LOWER RIGHT COLUMN
1D5C  FE CA                     5369     C          DEC     DL
1D5E                            5370     C  U4:                                             ; VIDEO-CALL-RETURN
1D5E  CD 10                     5371     C          INT     10H                             ; SCROLL UP THE SCREEN
1D60                            5372     C  U5:                                             ; TTY-RETURN
1D60  58                        5373     C          POP     AX                              ; RESTORE THE CHARACTER
1D61  E9 219E R                 5374     C          JMP     V_RET                           ; RETURN TO CALLER
1D64                            5375     C  U6:                                             ; SET-CURSOR-INC
1D64  FE C6                     5376     C          INC     DH                              ; NEXT ROW
1D66                            5377     C  U7:                                             ; SET-CURSOR
1D66  B4 02                     5378     C          MOV     AH,2
1D68  EB F4                     5379     C          JMP     U4                              ; ESTABLISH THE NEW CURSOR
                                5380     C
                                5381     C  ;----- BACK SPACE FOUND
                                5382     C
1D6A                            5383     C  U8:
1D6A  0A D2                     5384     C          OR      DL,DL                           ; ALREADY AT END OF LINE
1D6C  74 F8                     5385     C          JZ      U7                              ; SET CURSOR
1D6E  FE CA                     5386     C          DEC     DL                              ; NO -- JUST MOVE IT BACK
1D70  EB F4                     5387     C          JMP     U7                              ; SET_CURSOR
                                5388     C
                                5389     C  ;----- CARRIAGE RETURN FOUND
                                5390     C
1D72                            5391     C  U9:
1D72  2A D2                     5392     C          SUB     DL,DL                           ; MOVE TO FIRST COLUMN
1D74  EB F0                     5393     C          JMP     U7                              ; SET_CURSOR
                                5394     C
                                5395     C  ;----- LINE FEED FOUND
                                5396     C
1D76                            5397     C  U10:
1D76  3A 36 0484 R              5398     C          CMP     DH,ROWS                         ; BOTTOM OF SCREEN
1D7A  75 E8                     5399     C          JNE     U6                              ; YES, SCROLL THE SCREEN
1D7C  EB BB                     5400     C          JMP     U1                              ; NO, JUST SET THE CURSOR
                                5401     C
                                5402     C  ;----- BELL FOUND
                                5403     C
1D7E                            5404     C  U11:
1D7E  B3 02                     5405     C          MOV     BL,2                            ; SET UP COUNT FOR BEEP
1D80  E8 0D20 R                 5406     C          CALL    BEEP                            ; SOUND THE POD BELL
1D83  EB DB                     5407     C          JMP     U5                              ; TTY_RETURN
                                5408     C
                                5409     C
                                5410     C  ;----- CURRENT VIDEO STATE
                                5411     C
1D85                            5412     C  AHF:
                                5413     C          ASSUME DS:ABS0
1D85  8A 26 044A R              5414     C          MOV     AH,BYTE PTR CRT_COLS            ; GET NUMBER OF COLUMNS
1D89  8A 3E 0462 R              5415     C          MOV     BH,ACTIVE_PAGE
1D8D  A0 0487 R                 5416     C          MOV     AL,INFO
1D90  24 80                     5417     C          AND     AL,080H
1D92  0A 06 0449 R              5418     C          OR      AL,CRT_MODE
```

```
1D96  5F                    5419     C          POP     DI
1D97  5E                    5420     C          POP     SI
1D98  59                    5421     C          POP     CX                              ; DISCARD BX
1D99  59                    5422     C          POP     CX
1D9A  5A                    5423     C          POP     DX
1D9B  1F                    5424     C          POP     DS
1D9C  07                    5425     C          POP     ES
1D9D  5D                    5426     C          POP     BP
1D9E  CF                    5427     C          IRET
                            5428     C
                            5429     C          SUBTTL
                            5430
                            5431
1D9F                        5432          PAL_SET PROC    NEAR
1D9F  50                    5433                  PUSH    AX
1DA0  E8 0D05 R             5434                  CALL    WHAT_BASE
1DA3  FA                    5435                  CLI
1DA4                        5436          VR:
1DA4  EC                    5437                  IN      AL,DX
1DA5  A8 08                 5438                  TEST    AL,08H                          ; VERTICAL RETRACE
1DA7  74 FB                 5439                  JZ      VR
1DA9  58                    5440                  POP     AX
1DAA  B2 C0                 5441                  MOV     DL,ATTR_WRITE
1DAC  86 C4                 5442                  XCHG    AL,AH
1DAE  EE                    5443                  OUT     DX,AL
1DAF  86 C4                 5444                  XCHG    AL,AH
1DB1  EE                    5445                  OUT     DX,AL
1DB2  B0 20                 5446                  MOV     AL,020H
1DB4  EE                    5447                  OUT     DX,AL
1DB5  FB                    5448                  STI
1DB6  C3                    5449                  RET
1DB7                        5450          PAL_SET ENDP
                            5451
1DB7                        5452          PAL_ON  PROC    NEAR
1DB7  E8 1DC0 R             5453                  CALL    PAL_INIT
1DBA  B2 C0                 5454                  MOV     DL,ATTR_WRITE
1DBC  B0 20                 5455                  MOV     AL,020H
1DBE  EE                    5456                  OUT     DX,AL
1DBF  C3                    5457                  RET
1DC0                        5458          PAL_ON  ENDP
                            5459
1DC0                        5460          PAL_INIT        PROC    NEAR
1DC0  E8 0D05 R             5461                  CALL    WHAT_BASE
1DC3  EC                    5462                  IN      AL,DX
1DC4  C3                    5463                  RET
1DC5                        5464          PAL_INIT        ENDP
                            5465
                            5466          ;----- SET PALETTE REGISTERS
                            5467
1DC5                        5468          AH10:
                            5469                  ASSUME  DS:ABS0
1DC5  F6 06 0487 R 02       5470                  TEST    INFO,2
1DCA  75 07                 5471                  JNZ     BM_OK                           ; IN MONOCHROME MODE
                            5472
                            5473          ;----- HERE THE EGA IS IN A COLOR MODE
                            5474
1DCC  80 3E 0463 R B4       5475                  CMP     BYTE PTR ADDR_6845,0B4H
1DD1  74 33                 5476                  JE      BM_OUT
1DD3                        5477          BM_OK:
1DD3  8A E0                 5478                  MOV     AH,AL
1DD5  0A E4                 5479                  OR      AH,AH
1DD7  75 30                 5480                  JNZ     BM_1
                            5481
                            5482          ;----- SET INDIVIDUAL REGISTER
                            5483
1DD9  2B ED                 5484                  SUB     BP,BP
1DDB  C4 3E 04A8 R          5485                  LES     DI,SAVE_PTR
1DDF  83 C7 04              5486                  ADD     DI,4
1DE2  26: C4 3D             5487                  LES     DI,DWORD PTR ES:[DI]
1DE5  8C C0                 5488                  MOV     AX,ES
1DE7  0B C7                 5489                  OR      AX,DI
1DE9  74 01                 5490                  JZ      TLO_1
1DEB  45                    5491                  INC     BP
1DEC                        5492          TLO_1:
                            5493
1DEC  E8 1DC0 R             5494                  CALL    PAL_INIT
1DEF  8A E3                 5495                  MOV     AH,BL
1DF1  8A C7                 5496                  MOV     AL,BH
1DF3  E8 1D9F R             5497                  CALL    PAL_SET
1DF6  E8 1DB7 R             5498                  CALL    PAL_ON
1DF9  0B ED                 5499                  OR      BP,BP
1DFB  74 09                 5500                  JZ      BM_OUT
1DFD  8A C7                 5501                  MOV     AL,BH
1DFF  2A FF                 5502                  SUB     BH,BH
1E01  03 FB                 5503                  ADD     DI,BX
1E03  26: 88 05             5504                  MOV     ES:[DI],AL
1E06                        5505          BM_OUT:
1E06  E9 219E R             5506                  JMP     V_RET
                            5507
1E09                        5508          BM_1:
1E09  FE CC                 5509                  DEC     AH
1E0B  75 2D                 5510                  JNZ     BM_2
                            5511
1E0D  2B ED                 5512                  SUB     BP,BP
1E0F  C4 3E 04A8 R          5513                  LES     DI,SAVE_PTR
1E13  83 C7 04              5514                  ADD     DI,4
1E16  26: C4 3D             5515                  LES     DI,DWORD PTR ES:[DI]
1E19  8C C0                 5516                  MOV     AX,ES
1E1B  0B C7                 5517                  OR      AX,DI
1E1D  74 01                 5518                  JZ      TLO_2
1E1F  45                    5519                  INC     BP
1E20                        5520          TLO_2:
                            5521
                            5522          ;----- SET OVERSCAN REGISTER
                            5523
1E20  E8 1DC0 R             5524                  CALL    PAL_INIT
1E23  B4 11                 5525                  MOV     AH,011H
1E25  8A C7                 5526                  MOV     AL,BH
1E27  E8 1D9F R             5527                  CALL    PAL_SET
1E2A  E8 1DB7 R             5528                  CALL    PAL_ON
                            5529
1E2D  0B ED                 5530                  OR      BP,BP
1E2F  74 D5                 5531                  JZ      BM_OUT
1E31  83 C7 11              5532                  ADD     DI,011H
1E34  26: 88 3D             5533                  MOV     ES:[DI],BH
                            5534
1E37  E9 219E R             5535                  JMP     V_RET
                            5536
1E3A                        5537          BM_2:
1E3A  FE CC                 5538                  DEC     AH
1E3C  75 40                 5539                  JNZ     BM_3
                            5540
                            5541          ;----- SET 16 PALETTE REGISTERS AND OVERSCAN REGISTER
                            5542
1E3E  1E                    5543                  PUSH    DS
1E3F  06                    5544                  PUSH    ES
```

```
                                5545
1E40  C4 3E 04A8 R              5546                LES     DI,SAVE_PTR
1E44  83 C7 04                  5547                ADD     DI,4
1E47  26: C4 3D                 5548                LES     DI,DWORD PTR ES:[DI]            ; ES:DI PTR TO PAL SAVE AREA
1E4A  8C C0                     5549                MOV     AX,ES
1E4C  0B C7                     5550                OR      AX,DI
1E4E  74 09                     5551                JZ      TLO_3
                                5552
1E50  1F                        5553                POP     DS                              ; PARAMETER ES
1E51  1E                        5554                PUSH    DS
1E52  8B F2                     5555                MOV     SI,DX                           ; PARAMETER OFFSET
1E54  B9 0011                   5556                MOV     CX,17D
1E57  F3/ A4                    5557          REP   MOVSB
                                5558
1E59                            5559          TLO_3:
1E59  07                        5560                POP     ES
1E5A  1F                        5561                POP     DS
                                5562
1E5B  8B DA                     5563                MOV     BX,DX
1E5D  E8 1DC0 R                 5564                CALL    PAL_INIT
1E60  2A E4                     5565                SUB     AH,AH
1E62                            5566          BM_2A:
1E62  26: 8A 07                 5567                MOV     AL,ES:[BX]
1E65  E8 1D9F R                 5568                CALL    PAL_SET
1E68  FE C4                     5569                INC     AH
1E6A  43                        5570                INC     BX
1E6B  80 FC 10                  5571                CMP     AH,010H
1E6E  72 F2                     5572                JB      BM_2A
1E70  FE C4                     5573                INC     AH
1E72  26: 8A 07                 5574                MOV     AL,ES:[BX]
1E75  E8 1D9F R                 5575                CALL    PAL_SET
1E78  E8 1DB7 R                 5576                CALL    PAL_ON
1E7B  E9 219E R                 5577                JMP     V_RET
                                5578
1E7E                            5579          BM_3:
1E7E  FE CC                     5580                DEC     AH
1E80  75 29                     5581                JNZ     BM_4
                                5582
                                5583          ;----- TOGGLE INTENSIFY/BLINKING BIT
                                5584
1E82  53                        5585                PUSH    BX
1E83  E8 0D5A R                 5586                CALL    MAKE_BASE
1E86  83 C3 33                  5587                ADD     BX,010H + LN_4
1E89  26: 8A 07                 5588                MOV     AL,ES:[BX]
1E8C  5B                        5589                POP     BX
                                5590
1E8D  0A DB                     5591                OR      BL,BL
1E8F  75 0A                     5592                JNZ     BM_6
                                5593
                                5594          ;----- ENABLE INTENSIFY
                                5595
1E91  80 26 0465 R DF           5596                AND     CRT_MODE_SET,11011111B
1E96  24 F7                     5597                AND     AL,0F7H
1E98  EB 0C 90                  5598                JMP     BM_7
1E9B                            5599          BM_6:
1E9B  FE CB                     5600                DEC     BL
1E9D  75 07                     5601                JNZ     BM_7
                                5602
                                5603          ;----- ENABLE BLINK
                                5604
1E9F  80 0E 0465 R 20           5605                OR      CRT_MODE_SET,020H
1EA4  0C 08                     5606                OR      AL,08H
1EA6                            5607          BM_7:
1EA6  B4 10                     5608                MOV     AH,P_MODE
1EA8  E8 1D9F R                 5609                CALL    PAL_SET
1EAB                            5610          BM_4:
1EAB  E9 219E R                 5611                JMP     V_RET
                                5612
                                5613     C          INCLUDE         VCHGEN.INC
                                5614     C          SUBTTL          VCHGEN.INC
                                5615     C          PAGE
                                5616     C ;--------------------------------------------------
                                5617     C ; ENTRY                                         :
                                5618     C ;       AL = 0 USER SPECIFIED FONT              :
                                5619     C ;            1 8 X 14 FONT                      :
                                5620     C ;            2 8 X 8 DOUBLE DOT                 :
                                5621     C ;       BL = BLOCK TO LOAD                      :
                                5622     C ;--------------------------------------------------
1EAE                            5623     C CH_GEN:
1EAE  50                        5624     C          PUSH    AX                              ; SAVE THE INVOLVED REGS
1EAF  55                        5625     C          PUSH    BP
1EB0  53                        5626     C          PUSH    BX
1EB1  51                        5627     C          PUSH    CX
1EB2  52                        5628     C          PUSH    DX
1EB3  06                        5629     C          PUSH    ES
                                5630     C
                                5631     C          ASSUME  DS:ABS0
1EB4  E8 0CFE R                 5632     C          CALL    DDS                             ; SET DATA SEGMENT
1EB7  A0 0449 R                 5633     C          MOV     AL,CRT_MODE                     ; GET THE CURRENT MODE
1EBA  50                        5634     C          PUSH    AX                              ; SAVE IT
1EBB  3C 07                     5635     C          CMP     AL,7                            ; IS THIS MONOCHROME
1EBD  74 07                     5636     C          JE      H14                             ; MONOCHROME VALUES
1EBF  C6 06 0449 R 0B           5637     C          MOV     CRT_MODE,0BH                    ; COLOR VALUES
1EC4  EB 05                     5638     C          JMP     SHORT H15                       ; SKIP
1EC6                            5639     C H14:
1EC6  C6 06 0449 R 0C           5640     C          MOV     CRT_MODE,0CH                    ; MONOCHROME VALUES
1ECB                            5641     C H15:
1ECB  E8 0DAB R                 5642     C          CALL    SET_REGS
1ECE  E8 0CFE R                 5643     C          CALL    DDS                             ; RESET THE DATA SEGMENT
1ED1  58                        5644     C          POP     AX                              ; RECOVER OLD MODE VALUE
1ED2  A2 0449 R                 5645     C          MOV     CRT_MODE,AL                     ; RETURN TO LOW MEMORY
                                5646     C
1ED5  07                        5647     C          POP     ES                              ; RESTORE REGS THAT WERE
1ED6  5A                        5648     C          POP     DX                              ;  USED BY THE MODE SET
1ED7  59                        5649     C          POP     CX                              ;  ROUTINES
1ED8  5B                        5650     C          POP     BX
1ED9  5D                        5651     C          POP     BP
1EDA  58                        5652     C          POP     AX
                                5653     C
1EDB  0A C0                     5654     C          OR      AL,AL                           ; SET FLAGS
1EDD  74 17                     5655     C          JZ      DO_MAP2                         ; USER SPECIFIED FONT
1EDF  0E                        5656     C          PUSH    CS                              ; SET SEGMENT TO
1EE0  07                        5657     C          POP     ES                              ;  THIS MODULE
1EE1  2B D2                     5658     C          SUB     DX,DX                           ; ZERO OUT START OFFSET
1EE3  B9 0100                   5659     C          MOV     CX,0256D                        ; CHAR COUNT (FULL SET)
1EE6  FE C8                     5660     C          DEC     AL                              ; WHICH PARAMETER
1EE8  75 07                     5661     C          JNZ     H7                              ; MUST BE ONE
1EEA  B7 0E                     5662     C          MOV     BH,014D                         ; BYTES PER CHARACTER
1EEC  BD 0000 E                 5663     C          MOV     BP,OFFSET CGMN                  ; 8 X 14 TABLE OFFSET
1EEF  EB 05                     5664     C          JMP     SHORT DO_MAP2                   ; STORE IT
1EF1                            5665     C H7:
1EF1  B7 08                     5666     C          MOV     BH,8                            ; 8 X 8 FONT
1EF3  BD 0000 E                 5667     C          MOV     BP,OFFSET CGDDOT                ; ROM 8 X 8 DOUBLE DOT
                                5668     C
                                5669     C ;--------------------------------------------------
                                5670     C ; ALPHA CHARACTER GENERATOR LOAD                :
```

```
                        5671     C  ;                                                  :
                        5672     C  ; ENTRY                                          :
                        5673     C  ;       ES:BP - POINTER TO TABLE                 :
                        5674     C  ;       CX    - COUNT OF CHARS                   :
                        5675     C  ;       DX    - CHAR COUNT OFFSET INTO MAP 2     :
                        5676     C  ;       BH    - BYTES PER CHARACTER              :
                        5677     C  ;       BL    - MAP 2 BLOCK TO LOAD              :
                        5678     C  ;-----------------------------------------------
1EF6                    5679     C  DO_MAP2:
1EF6  06                5680     C          PUSH    ES                              ; FONT TABLE SEGMENT
1EF7  1F                5681     C          POP     DS                              ; ADDRESSING TO TABLE
1EF8  52                5682     C          PUSH    DX                              ; SAVE REGISTER
                        5683     C          SRLOAD  ES,0A000H                       ; ADDRESSING TO MAP 2
1EF9  BA A000           5684     C+          MOV     DX,0A000H
1EFC  8E C2             5685     C+          MOV     ES,DX
1EFE  5A                5686     C          POP     DX                              ; RECOVER REGISTER
1EFF  51                5687     C          PUSH    CX                              ; MULTIPLY BY 020H SINCE
1F00  B1 05             5688     C          MOV     CL,5                            ;  MAXIMUM BYTES PER
1F02  D3 E2             5689     C          SHL     DX,CL                           ;  CHARACTER IS 32D=020H
1F04  59                5690     C          POP     CX                              ; RECOVER
1F05  0A DB             5691     C          OR      BL,BL                           ; WHICH 16K BLOCK TO LOAD
1F07  74 08             5692     C          JZ      H3                              ; BLOCK ZERO
1F09                    5693     C  H4:
1F09  81 C2 4000        5694     C          ADD     DX,04000H                       ; INCREMENT TO NEXT BLOCK
1F0D  FE CB             5695     C          DEC     BL                              ; ANY MORE
1F0F  75 F8             5696     C          JNZ     H4                              ; DO ANOTHER
1F11                    5697     C  H3:
1F11  8A C7             5698     C          MOV     AL,BH                           ; BYTES PER CHARACTER
1F13  2A E4             5699     C          SUB     AH,AH                           ; ZERO
1F15  8B FA             5700     C          MOV     DI,DX                           ; OFFSET INTO MAP
1F17  8B F5             5701     C          MOV     SI,BP                           ; OFFSET INTO TABLE
1F19  E3 0D             5702     C          JCXZ    LD_OVER                         ; CHARACTER COUNT
1F1B                    5703     C  LD:
1F1B  51                5704     C          PUSH    CX                              ; SAVE CHARACTER COUNT
1F1C  8B C8             5705     C          MOV     CX,AX                           ; ONE ENTIRE CHARACTER
1F1E  F3/ A4            5706     C          REP     MOVSB                           ;  AT A TIME
1F20  2B F8             5707     C          SUB     DI,AX                           ; ADJUST OFFSET
1F22  83 C7 20          5708     C          ADD     DI,020H                         ; NEXT CHARACTER POSITION
1F25  59                5709     C          POP     CX                              ; RECOVER CHARACTER COUNT
1F26  E2 F3             5710     C          LOOP    LD                              ; DO THE REST
1F28                    5711     C  LD_OVER:
1F28  C3                5712     C          RET
                        5713     C
1F29                    5714     C  BRK_1:
                        5715     C          ASSUME  DS:ABS0
1F29  E8 0CFE R         5716     C          CALL    DDS                             ; SET LOW MEMORY SEGMENT
1F2C  A3 0485 R         5717     C          MOV     POINTS,AX                       ; GET BYTES/CHARACTER
1F2F  8B 16 0463 R      5718     C          MOV     DX,ADDR_6845                    ; CRTC REGISTER
1F33  80 3E 0449 R 07   5719     C          CMP     CRT_MODE,7
1F38  75 05             5720     C          JNE     H11A
1F3A  B4 14             5721     C          MOV     AH,C_UNDERLN_LOC                ; R14H
1F3C  E8 0D15 R         5722     C          CALL    OUT_DX                          ; SET THE UNDERLINE LOC
1F3F                    5723     C  H11A:
1F3F  FE C8             5724     C          DEC     AL                              ; POINTS - 1
1F41  B4 09             5725     C          MOV     AH,C_MAX_SCAN_LN                ; R09H
1F43  E8 0D15 R         5726     C          CALL    OUT_DX                          ; SET THE CHARACTER HEIGHT
1F46  FE C8             5727     C          DEC     AL                              ; POINTS - 2
                        5728     C
1F48  8A E8             5729     C          MOV     CH,AL                           ; CURSOR START
1F4A  8A C8             5730     C          MOV     CL,AL                           ; CURSOR END
1F4C  FE C1             5731     C          INC     CL                              ; ADJUST END
1F4E  B4 01             5732     C          MOV     AH,1                            ; SET C_TYPE BIOS CALL
1F50  CD 10             5733     C          INT     10H                             ; SET THE CURSOR
                        5734     C
1F52  8A 1E 0449 R      5735     C          MOV     BL,CRT_MODE                     ; GET THE CURRENT MODE
1F56  B8 015E           5736     C          MOV     AX,350D                         ; MAX SCANS ON SCREEN
1F59  80 FB 03          5737     C          CMP     BL,3                            ; 640X200 ALPHA MODES
1F5C  77 08             5738     C          JA      H11                             ; MUST BE 350
1F5E  E8 0E9A R         5739     C          CALL    BRST_DET
1F61  72 03             5740     C          JC      H11
1F63  B8 00C8           5741     C          MOV     AX,200D                         ; SET FOR 200
1F66                    5742     C  H11:
1F66  99                5743     C          CWD                                     ; PREPARE TO DIVIDE
1F67  F7 36 0485 R      5744     C          DIV     POINTS                          ; MAX ROWS ON SCREEN
1F6B  48                5745     C          DEC     AX                              ; ADJUST
1F6C  A2 0484 R         5746     C          MOV     ROWS,AL                         ; SAVE ROWS
1F6F  FE C0             5747     C          INC     AL                              ; READJUST
1F71  2A E4             5748     C          SUB     AH,AH                           ; CLEAR
1F73  F7 26 0485 R      5749     C          MUL     POINTS                          ; ROWS*BYTES/CHAR
1F77  48                5750     C          DEC     AX                              ; ADJUST
1F78  8B 16 0463 R      5751     C          MOV     DX,ADDR_6845                    ; CRTC ADDRESS
1F7C  B4 12             5752     C          MOV     AH,C_VRT_DSP_END                ; SCANS DISPLAYED
1F7E  E8 0D15 R         5753     C          CALL    OUT_DX                          ; SET IT
1F81  A0 0484 R         5754     C          MOV     AL,ROWS                         ; GET CHARACTER ROWS
1F84  FE C0             5755     C          INC     AL                              ; ADJUST
1F86  F6 26 044A R      5756     C          MUL     BYTE PTR CRT_COLS               ; ROWS*COLUMNS
1F8A  D1 E0             5757     C          SHL     AX,1                            ; *2 FOR ALPHA MODE
1F8C  05 0100           5758     C          ADD     AX,256D                         ; SPACE BETWEEN PAGES
1F8F  A3 044C R         5759     C          MOV     CRT_LEN,AX                      ; BYTES PER PAGE
1F92  E8 0E96 R         5760     C          CALL    PH_5                            ; VIDEO ON
1F95  E9 219E R         5761     C          JMP     V_RET                           ; RETURN TO CALLER
                        5762     C
                        5763     C  ;----- LOADABLE CHARACTER GENERATOR ROUTINES
                        5764     C
1F98                    5765     C  AH11:
1F98  3C 10             5766     C          CMP     AL,010H                         ; CHECK PARAMETER
1F9A  73 37             5767     C          JAE     AH11_ALPHA1                     ; NEXT STAGE
                        5768     C
                        5769     C  ;----- ALPHA MODE ACTIVITY HERE
                        5770     C
1F9C  3C 03             5771     C          CMP     AL,03H                          ; RANGE CHECK
1F9E  73 17             5772     C          JAE     H1                              ; NEXT STAGE
1FA0  E8 1EAE R         5773     C          CALL    CH_GEN                          ; SET THE CHAR GEN
1FA3  E8 0DAB R         5774     C          CALL    SET_REGS
1FA6  E8 0E96 R         5775     C          CALL    PH_5                            ; VIDEO ON
                        5776     C          ASSUME  DS:ABS0
1FA9  E8 0CFE R         5777     C          CALL    DDS                             ; SET THE DATA SEGMENT
1FAC  8B 0E 0460 R      5778     C          MOV     CX,CURSOR_MODE                  ; GET THE MODE
1FB0  B4 01             5779     C          MOV     AH,1                            ; SET C_TYPE
1FB2  CD 10             5780     C          INT     10H                             ; EMULATE CORRECT CURSOR
1FB4  E9 219E R         5781     C          JMP     V_RET                           ; RETURN TO CALLER
                        5782     C
                        5783     C  ;----- SET THE CHARACTER GENERATOR BLOCK SELECT REGISTER
                        5784     C
1FB7                    5785     C  H1:
1FB7  75 17             5786     C          JNE     H2                              ; NOT IN RANGE
1FB9  B6 03             5787     C          MOV     DH,3
1FBB  B2 C4             5788     C          MOV     DL,SEQ_ADDR                     ; SEQUENCER
                        5789     C
1FBD  B8 0001           5790     C          MOV     AX,1                            ; AH=S_RESET, AL=1
1FC0  E8 0D15 R         5791     C          CALL    OUT_DX
                        5792     C
1FC3  B4 03             5793     C          MOV     AH,S_CGEN                       ; CHAR BLOCK REGISTER
1FC5  8A C3             5794     C          MOV     AL,BL                           ; GET THE VALUE
1FC7  E8 0D15 R         5795     C          CALL    OUT_DX                          ; SET IT
                        5796     C
```

```
1FCA  B8 0003             5797     C          MOV     AX,3                          ; AH=S_RESET, AL=3
1FCD  E8 0D15 R           5798     C          CALL    OUT_DX
1FD0                      5799     C  H2:
1FD0  E9 219E R           5800     C          JMP     V_RET                         ; RETURN TO CALLER
                          5801     C
1FD3                      5802     C  AH11_ALPHA1:
                          5803     C          ASSUME  DS:ABS0
1FD3  3C 20               5804     C          CMP     AL,020H
1FD5  73 26               5805     C          JAE     AH11_GRAPHICS
                          5806     C
                          5807     C  ;----- ALPHA MODE ACTIVITY HERE
                          5808     C
1FD7  2C 10               5809     C          SUB     AL,010H                       ; ADJUST TO 0 - N
1FD9  3C 02               5810     C          CMP     AL,02H                        ; RANGE CHECK
1FDB  77 F3               5811     C          JA      H2                            ; INVALID CALL
1FDD  50                  5812     C          PUSH    AX                            ; SAVE
1FDE  53                  5813     C          PUSH    BX
1FDF  E8 1EAE R           5814     C          CALL    CH_GEN                        ; LOAD THE CHAR GEN
1FE2  E8 0DAB R           5815     C          CALL    SET_REGS
1FE5  5B                  5816     C          POP     BX
1FE6  58                  5817     C          POP     AX                            ; RESTORE
1FE7  8A E0               5818     C          MOV     AH,AL                         ; CALLING PARAMETER
1FE9  0A E4               5819     C          OR      AH,AH                         ; USER MODE
1FEB  8A C7               5820     C          MOV     AL,BH
1FED  74 09               5821     C          JZ      H13                           ; DO NOT SET BYTES/CHAR
1FEF  B0 08               5822     C          MOV     AL,8                          ; 8 X 8 FONT
1FF1  80 FC 01            5823     C          CMP     AH,1                          ; IS THE CALL FOR MONOC
1FF4  75 02               5824     C          JNE     H13                           ; NO, LEAVE IT AT 8
1FF6  B0 0E               5825     C          MOV     AL,14D                        ; MONOC SET
1FF8                      5826     C  H13:
1FF8  2A E4               5827     C          SUB     AH,AH                         ; CLEAR UPPER BYTE
1FFA  E9 1F29 R           5828     C          JMP     BRK_1                         ; CONTINUE
                          5829     C
                          5830     C  ;----- GRAPHICS MODE ACTIVITY HERE
                          5831     C
1FFD                      5832     C  AH11_GRAPHICS:
                          5833     C          ASSUME  DS:ABS0
1FFD  3C 30               5834     C          CMP     AL,030H
1FFF  73 6A               5835     C          JAE     AH11_INFORM
2001  2C 20               5836     C          SUB     AL,020H
2003  75 11               5837     C          JNE     F10
                          5838     C
                          5839     C  ;----- COMPATIBILITY, UPPER HALF GRAPHICS CHARACTER SET
                          5840     C
                          5841     C          ASSUME  DS:ABS0
                          5842     C          SRLOAD  DS,0
2005  2B D2               5843     C+          SUB     DX,DX
2007  8E DA               5844     C+          MOV     DS,DX
2009  FA                  5845     C          CLI
200A  89 2E 007C R        5846     C          MOV     WORD PTR EXT_PTR ,BP
200E  8C 06 007E R        5847     C          MOV     WORD PTR EXT_PTR+2,ES
2012  FB                  5848     C          STI
2013                      5849     C  F11:
2013  E9 219E R           5850     C          JMP     V_RET
2016                      5851     C  F10:
                          5852     C          ASSUME  DS:ABS0
2016  52                  5853     C          PUSH    DX
                          5854     C          SRLOAD  DS,0
2017  2B D2               5855     C+          SUB     DX,DX
2019  8E DA               5856     C+          MOV     DS,DX
201B  5A                  5857     C          POP     DX
201C  3C 03               5858     C          CMP     AL,03H                        ; RANGE CHECK
201E  77 F3               5859     C          JA      F11
2020  FE C8               5860     C          DEC     AL
2022  74 14               5861     C          JZ      F19
2024  0E                  5862     C          PUSH    CS
2025  07                  5863     C          POP     ES
2026  FE C8               5864     C          DEC     AL
2028  75 08               5865     C          JNZ     F13
202A  B9 000E             5866     C          MOV     CX,14D
202D  BD 0000 E           5867     C          MOV     BP,OFFSET CGMN                ; ROM 8 X 14 CHARACTER SET
2030  EB 06               5868     C          JMP     SHORT F19
2032                      5869     C  F13:
2032  B9 0008             5870     C          MOV     CX,8
2035  BD 0000 E           5871     C          MOV     BP,OFFSET CGDDOT              ; ROM 8 X 8 DOUBLE DOT
2038                      5872     C  F19:
2038  FA                  5873     C          CLI
2039  89 2E 010C R        5874     C          MOV     WORD PTR GRX_SET , BP
203D  8C 06 010E R        5875     C          MOV     WORD PTR GRX_SET + 2, ES
2041  FB                  5876     C          STI
                          5877     C          ASSUME  DS:ABS0
2042  E8 0CFE R           5878     C          CALL    DDS
2045  89 0E 0485 R        5879     C          MOV     POINTS,CX
2049  8A C3               5880     C          MOV     AL,BL
204B  BB 2067 R           5881     C          MOV     BX,OFFSET RT
204E  0A C0               5882     C          OR      AL,AL
2050  75 05               5883     C          JNZ     DR_3
2052  8A C2               5884     C          MOV     AL,DL
2054  EB 09 90            5885     C          JMP     DR_1
2057                      5886     C  DR_3:
2057  3C 03               5887     C          CMP     AL,3
2059  76 02               5888     C          JBE     DR_2
205B  B0 02               5889     C          MOV     AL,2
205D                      5890     C  DR_2:
205D  2E: D7              5891     C          XLAT    CS:RT
205F                      5892     C  DR_1:
205F  FE C8               5893     C          DEC     AL
2061  A2 0484 R           5894     C          MOV     ROWS,AL
2064  E9 219E R           5895     C          JMP     V_RET
                          5896     C
2067                      5897     C  RT      LABEL BYTE
2067  00 0E 19 2B         5898     C          DB      00D,14D,25D,43D
                          5899     C
                          5900     C
                          5901     C  ;----- INFORMATION RETURN DONE HERE
                          5902     C
206B                      5903     C  AH11_INFORM:
                          5904     C          ASSUME  DS:ABS0
206B  3C 30               5905     C          CMP     AL,030H
206D  74 03               5906     C          JE      F6
206F                      5907     C  F5:
206F  E9 219E R           5908     C          JMP     V_RET
2072                      5909     C  F6:
2072  8B 0E 0485 R        5910     C          MOV     CX,POINTS
2076  8A 16 0484 R        5911     C          MOV     DL,ROWS
207A  80 FF 07            5912     C          CMP     BH,7
207D  77 F0               5913     C          JA      F5
207F  80 FF 01            5914     C          CMP     BH,1
2082  77 18               5915     C          JA      FT
                          5916     C
                          5917     C          ASSUME  DS:ABS0
2084  52                  5918     C          PUSH    DX
                          5919     C          SRLOAD  DS,0
2085  2B D2               5920     C+          SUB     DX,DX
2087  8E DA               5921     C+          MOV     DS,DX
2089  5A                  5922     C          POP     DX
```

```
208A  0A FF                5923     C          OR      BH,BH
208C  75 07                5924     C          JNZ     F9
208E  C4 2E 007C R         5925     C          LES     BP,EXT_PTR
2092  EB 1A 90             5926     C          JMP     INFORM_OUT
2095                       5927     C  F9:
2095  C4 2E 010C R         5928     C          LES     BP,GRX_SET
2099  EB 13 90             5929     C          JMP     INFORM_OUT
                           5930     C
                           5931     C  ;----- HANDLE BH = 2  THRU  BH = 5 HERE RETURN ROM TABLE POINTERS
                           5932     C
209C                       5933     C  FT:
                           5934     C          ASSUME  DS:ABS0
209C  80 EF 02             5935     C          SUB     BH,2
209F  8A DF                5936     C          MOV     BL,BH
20A1  2A FF                5937     C          SUB     BH,BH
20A3  D1 E3                5938     C          SAL     BX,1
20A5  81 C3 20B7 R         5939     C          ADD     BX,OFFSET TBL_5
20A9  2E: 8B 2F            5940     C          MOV     BP,CS:[BX]
20AC  0E                   5941     C          PUSH    CS
20AD  07                   5942     C          POP     ES
                           5943     C
20AE                       5944     C  INFORM_OUT:
20AE  5F                   5945     C          POP     DI
20AF  5E                   5946     C          POP     SI
20B0  5B                   5947     C          POP     BX
20B1  58                   5948     C          POP     AX                              ; DISCARD SAVED CX
20B2  58                   5949     C          POP     AX                              ; DISCARD SAVED DX
20B3  1F                   5950     C          POP     DS
20B4  58                   5951     C          POP     AX                              ; DISCARD SAVED ES
20B5  58                   5952     C          POP     AX                              ; DISCARD SAVED BP
20B6  CF                   5953     C          IRET
                           5954     C
                           5955     C  ;----- TABLE OF CHARACTER GENERATOR OFFSETS
                           5956     C
20B7                       5957     C  TBL_5 LABEL WORD
20B7  0000 E               5958     C          DW      OFFSET CGMN
20B9  0000 E               5959     C          DW      OFFSET CGDDOT
20BB  0000 E               5960     C          DW      OFFSET INT_1F_1
20BD  0000 E               5961     C          DW      OFFSET CGMN_FDG
                           5962     C
                           5963     C          SUBTTL
                           5964
                           5965        ;----- ALTERNATE SELECT
                           5966
20BF                       5967        AH12:
                           5968                ASSUME  DS:ABS0
20BF  80 FB 10             5969                CMP     BL,010H                         ; RETURN ACTIVE CALL
20C2  72 51                5970                JB      ACT_1
20C4  74 1B                5971                JE      ACT_3
20C6  80 FB 20             5972                CMP     BL,020H                         ; ALTERNATE PRINT SCREEN
20C9  74 03                5973                JE      ACT_2
20CB  E9 219E R            5974                JMP     V_RET                           ; INVALID CALL
20CE                       5975        ACT_2:                                          ; NEW PRINT SCREEN
                           5976                SRLOAD  DS,0
20CE  2B D2                5977      +          SUB     DX,DX
20D0  8E DA                5978      +          MOV     DS,DX
20D2  FA                   5979                CLI
20D3  C7 06 0014 R 21A7 R  5980                MOV     WORD PTR INT5_PTR,OFFSET PRINT_SCREEN
20D9  8C 0E 0016 R         5981                MOV     WORD PTR INT5_PTR+2,CS
20DD  FB                   5982                STI
20DE  E9 219E R            5983                JMP     V_RET
20E1                       5984        ACT_3:
20E1  8A 3E 0487 R         5985                MOV     BH,INFO                         ; LOOKING FOR MONOC BIT
20E5  80 E7 02             5986                AND     BH,2                            ; ISOLATE
20E8  D0 EF                5987                SHR     BH,1                            ; ADJUST
                           5988
20EA  A0 0487 R            5989                MOV     AL,INFO                         ; LOOKING FOR MEMORY
20ED  24 60                5990                AND     AL,01100000B                    ; MEMORY BITS
20EF  B1 05                5991                MOV     CL,5                            ; SHIFT COUNT
20F1  D2 E8                5992                SHR     AL,CL                           ; ADJUST MEM VALUE
20F3  8A D8                5993                MOV     BL,AL                           ; RETURN REGISTER
                           5994
20F5  8A 0E 0488 R         5995                MOV     CL,INFO_3                       ; FEATURE/SWITCH
20F9  8A E9                5996                MOV     CH,CL                           ; DUPLICATE IN CH
20FB  80 E1 0F             5997                AND     CL,0FH                          ; MASK OFF SWITCH VALUE
20FE  D0 ED                5998                SHR     CH,1                            ; MOVE FEATURE VALUE
2100  D0 ED                5999                SHR     CH,1
2102  D0 ED                6000                SHR     CH,1
2104  D0 ED                6001                SHR     CH,1
2106  80 E5 0F             6002                AND     CH,0FH                          ; MASK IT
                           6003
2109  5F                   6004                POP     DI
210A  5E                   6005                POP     SI
210B  5A                   6006                POP     DX                              ; DISCARD BX
210C  5A                   6007                POP     DX                              ; DISCARD CX
210D  5A                   6008                POP     DX
210E  1F                   6009                POP     DS
210F  07                   6010                POP     ES
2110  5D                   6011                POP     BP
2111  CF                   6012                IRET
2112                       6013        AH12_X:
2112  E9 219E R            6014                JMP     V_RET                           ; RETURN TO CALLER
2115                       6015        ACT_1:
2115                       6016        STR_OUTZ:
2115  E9 219E R            6017                JMP     V_RET                           ; RETURN TO CALLER
                           6018
                           6019        ;----- WRITE STRING
                           6020
2118                       6021        AH13:
2118  3C 04                6022                CMP     AL,004                          ; RANGE CHECK
211A  73 F9                6023                JAE     STR_OUTZ                        ; INVALID PARAMETER
211C  E3 F7                6024                JCXZ    STR_OUTZ
211E  53                   6025                PUSH    BX                              ; SAVE REGISTER
211F  8A DF                6026                MOV     BL,BH                           ; GET PAGE TO LOW BYTE
2121  2A FF                6027                SUB     BH,BH
2123  D1 E3                6028                SAL     BX,1                            ; *2 FOR WORD OFFSET
2125  8B B7 0450 R         6029                MOV     SI,[BX + OFFSET CURSOR_POSN]    ; GET CURSOR POSITION
2129  5B                   6030                POP     BX                              ; RESTORE
212A  56                   6031                PUSH    SI                              ; CURRENT VALUE ON STACK
                           6032
212B  50                   6033                PUSH    AX
212C  B8 0200              6034                MOV     AX,0200H                        ; SET THE CURSOR POSITION
212F  CD 10                6035                INT     10H
2131  58                   6036                POP     AX
2132                       6037        STR_1:
2132  51                   6038                PUSH    CX
2133  53                   6039                PUSH    BX
2134  50                   6040                PUSH    AX
2135  86 E0                6041                XCHG    AH,AL
2137  26: 8A 46 00         6042                MOV     AL,ES:[BP]                      ; GET THE CHAR TO WRITE
213B  45                   6043                INC     BP
213C  3C 0D                6044                CMP     AL,0DH                          ; CARRIAGE RETURN
213E  74 3D                6045                JE      STR_CR_LF
2140  3C 0A                6046                CMP     AL,0AH                          ; LINE FEED
2142  74 39                6047                JE      STR_CR_LF
2144  3C 08                6048                CMP     AL,08H                          ; BACKSPACE
```

```
2146  74 35                6049                JE      STR_CR_LF
2148  3C 07                6050                CMP     AL,07H                          ; BELL
214A  74 31                6051                JE      STR_CR_LF
214C  B9 0001              6052                MOV     CX,1                            ; COUNT OF CHARACTERS
214F  80 FC 02             6053                CMP     AH,2                            ; CHECK WHERE ATTR IS
2152  72 05                6054                JB      DO_STR                          ; NOT IN THE STRING
2154  26: 8A 5E 00          6055                MOV     BL,ES:[BP]                      ; GET THE ATTRIBUTE
2158  45                   6056                INC     BP                              ; NEXT ITEM IN STRING
2159                       6057          DO_STR:
2159  B4 09                6058                MOV     AH,09H                          ; WRITE THE CHAR/ATTR
215B  CD 10                6059                INT     10H
215D  FE C2                6060                INC     DL                              ; NEXT CURSOR POSITION
215F  3A 16 044A R         6061                CMP     DL,BYTE PTR CRT_COLS            ; COLUMN OVERFLOW
2163  72 11                6062                JB      STR_2                           ; NOT YET
2165  3A 36 0484 R         6063                CMP     DH,ROWS
2169  75 07                6064                JNE     STR_3
216B  B8 0E0A              6065                MOV     AX,0E0AH
216E  CD 10                6066                INT     10H
2170  FE CE                6067                DEC     DH
2172                       6068          STR_3:
2172  FE C6                6069                INC     DH                              ; NEXT ROW
2174  2A D2                6070                SUB     DL,DL                           ; COLUMN ZERO
2176                       6071          STR_2:
2176  B8 0200              6072                MOV     AX,0200H                        ; SET THE CURSOR
2179  CD 10                6073                INT     10H
217B  EB 0E                6074                JMP     SHORT STR_4
217D                       6075          STR_CR_LF:
217D  B4 0E                6076                MOV     AH,0EH
217F  CD 10                6077                INT     10H
2181  8A DF                6078                MOV     BL,BH                           ; GET PAGE TO LOW BYTE
2183  2A FF                6079                SUB     BH,BH
2185  D1 E3                6080                SAL     BX,1                            ; *2 FOR WORD OFFSET
2187  8B 97 0450 R         6081                MOV     DX,[BX + OFFSET CURSOR_POSN]    ; GET CURSOR POSITION
218B                       6082          STR_4:
218B  58                   6083                POP     AX
218C  5B                   6084                POP     BX
218D  59                   6085                POP     CX
218E  E2 A2                6086                LOOP    STR_1
                           6087
2190  5A                   6088                POP     DX                              ; RECOVER CURSOR POSITION
                           6089                                                        ;  FROM PUSH SI ABOVE
2191  3C 01                6090                CMP     AL,1
2193  74 09                6091                JE      STR_OUT
2195  3C 03                6092                CMP     AL,3
2197  74 05                6093                JE      STR_OUT
2199  B8 0200              6094                MOV     AX,0200H                        ; SET CURSOR POSITION
219C  CD 10                6095                INT     10H
219E                       6096          STR_OUT:
                           6097                                                        ; ALLOW FALL THROUGH
                           6098
                           6099
219E                       6100          V_RET   PROC    NEAR                            ; VIDEO BIOS RETURN
219E  5F                   6101                POP     DI
219F  5E                   6102                POP     SI
21A0  5B                   6103                POP     BX
21A1  59                   6104                POP     CX
21A2  5A                   6105                POP     DX
21A3  1F                   6106                POP     DS
21A4  07                   6107                POP     ES
21A5  5D                   6108                POP     BP
21A6  CF                   6109                IRET
21A7                       6110          V_RET   ENDP
                           6111
21A7                       6112          COMBO_VIDEO     ENDP
                           6113
                           6114     C            INCLUDE         VPRSC.INC
                           6115     C            SUBTTL  VPRSC.INC
                           6116     C            PAGE
                           6117     C    ;--------------------------------------------------------------------------
                           6118     C    ; INTERRUPT 5                                                           :
                           6119     C    ;       THIS LOGIC WILL BE INVOKED BY INTERRUPT 05H TO PRINT THE         :
                           6120     C    ;       SCREEN. THE CURSOR POSITION AT THE TIME THIS ROUTINE IS INVOKED :
                           6121     C    ;       WILL BE SAVED AND RESTORED UPON COMPLETION. THE ROUTINE IS       :
                           6122     C    ;       INTENDED TO RUN WITH INTERRUPTS ENABLED. IF A SUBSEQUENT         :
                           6123     C    ;       'PRINT SCREEN' KEY IS DEPRESSED DURING THE TIME THIS ROUTINE     :
                           6124     C    ;       IS PRINTING IT WILL BE IGNORED.                                  :
                           6125     C    ;       ADDRESS 50:0 CONTAINS THE STATUS OF THE PRINT SCREEN:            :
                           6126     C    ;                                                                        :
                           6127     C    ;       50:0    =0      EITHER PRINT SCREEN HAS NOT BEEN CALLED          :
                           6128     C    ;                       OR UPON RETURN FROM A CALL THIS INDICATES        :
                           6129     C    ;                       A SUCCESSFUL OPERATION.                          :
                           6130     C    ;               =1      PRINT SCREEN IS IN PROGRESS                      :
                           6131     C    ;               =255    ERROR ENCOUNTERED DURING PRINTING                :
                           6132     C    ;--------------------------------------------------------------------------
                           6133     C            ASSUME  CS:CODE,DS:ABS0
21A7                       6134     C    PRINT_SCREEN    PROC    FAR
21A7  FB                   6135     C            STI                             ; MUST RUN WITH INTS ENABLED
21A8  1E                   6136     C            PUSH    DS                      ; MUST USE 50:0 FOR DATA
21A9  50                   6137     C            PUSH    AX                      ;  AREA STORAGE
21AA  53                   6138     C            PUSH    BX
21AB  51                   6139     C            PUSH    CX                      ; USE THIS LATER FOR CURSOR LIMITS
21AC  52                   6140     C            PUSH    DX                      ; WILL HOLD CURRENT CURSOR POS
21AD  E8 0CFE R            6141     C            CALL    DDS
21B0  80 3E 0500 R 01      6142     C            CMP     STATUS_BYTE,1           ; SEE IF PRINT ALREADY IN PROGRESS
21B5  74 63                6143     C            JZ      EXIT                    ; JUMP IF PRINT IN PROGRESS
21B7  C6 06 0500 R 01      6144     C            MOV     STATUS_BYTE,1           ; INDICATE PRINT NOW IN PROGRESS
21BC  B4 0F                6145     C            MOV     AH,15                   ; WILL REQUEST THE CURRENT MODE
21BE  CD 10                6146     C            INT     10H                     ;       [AL]=MODE (NOT USED)
                           6147     C                                            ;       [AH]=NUMBER COLUMNS/LINE
                           6148     C                                            ;       [BH]=VISUAL PAGE
                           6149     C    ;--------------------------------------------------------------------
                           6150     C    ;       AT THIS POINT WE KNOW THE COLUMNS/LINE ARE IN            :
                           6151     C    ;       [AX] AND THE PAGE IF APPLICABLE IS IN [BH]. THE STACK    :
                           6152     C    ;       HAS DS,AX,BX,CX,DX PUSHED. [AL] HAS VIDEO MODE           :
                           6153     C    ;--------------------------------------------------------------------
21C0  8A CC                6154     C            MOV     CL,AH                   ; WILL MAKE USE OF [CX] REG TO
21C2  8A 2E 0484 R         6155     C            MOV     CH,ROWS                 ; CONTROL ROW & COLUMNS
21C6  FE C5                6156     C            INC     CH                      ; ADJUST
21C8  E8 2220 R            6157     C            CALL    CRLF                    ; CAR RETURN LINE FEED ROUTINE
21CB  51                   6158     C            PUSH    CX                      ; SAVE SCREEN BOUNDS
21CC  B4 03                6159     C            MOV     AH,3                    ; WILL NOW READ THE CURSOR,
21CE  CD 10                6160     C            INT     10H                     ; AND PRESERVE THE POSITION
21D0  59                   6161     C            POP     CX                      ; RECALL SCREEN BOUNDS
21D1  52                   6162     C            PUSH    DX                      ; RECALL [BH]=VISUAL PAGE
21D2  33 D2                6163     C            XOR     DX,DX                   ; SET CURSOR POSITION TO (0,0)
                           6164     C    ;--------------------------------------------------------------------
                           6165     C    ;       THE LOOP FROM PRI10 TO THE INSTRUCTION PRIOR TO PRI20    :
                           6166     C    ;       IS THE LOOP TO READ EACH CURSOR POSITION FROM THE         :
                           6167     C    ;       SCREEN AND PRINT.                                        :
                           6168     C    ;--------------------------------------------------------------------
21D4                       6169     C    PRI10:
21D4  B4 02                6170     C            MOV     AH,2                    ; TO INDICATE CURSOR SET REQUEST
21D6  CD 10                6171     C            INT     10H                     ; NEW CURSOR POS ESTABLISHED
21D8  B4 08                6172     C            MOV     AH,8                    ; TO INDICATE READ CHARACTER
21DA  CD 10                6173     C            INT     10H                     ; CHARACTER NOW IN [AL]
21DC  0A C0                6174     C            OR      AL,AL                   ; SEE IF VALID CHAR
```

```
21DE  75 02                6175     C          JNZ     PRI15                   ; JUMP IF VALID CHAR
21E0  B0 20                6176     C          MOV     AL,' '                  ; MAKE A BLANK
21E2                       6177     C  PRI15:
21E2  52                   6178     C          PUSH    DX                      ; SAVE CURSOR POSITION
21E3  33 D2                6179     C          XOR     DX,DX                   ; INDICATE PRINTER 1
21E5  32 E4                6180     C          XOR     AH,AH                   ; TO INDICATE PRINT CHAR IN [AL]
21E7  CD 17                6181     C          INT     17H                     ; PRINT THE CHARACTER
21E9  5A                   6182     C          POP     DX                      ; RECALL CURSOR POSITION
21EA  F6 C4 29             6183     C          TEST    AH,029H                 ; TEST FOR PRINTER ERROR
21ED  75 21                6184     C          JNZ     ERR10                   ; JUMP IF ERROR DETECTED
21EF  FE C2                6185     C          INC     DL                      ; ADVANCE TO NEXT COLUMN
21F1  3A CA                6186     C          CMP     CL,DL                   ; SEE IF AT END OF LINE
21F3  75 DF                6187     C          JNZ     PRI10                   ; IF NOT PROCEED
21F5  32 D2                6188     C          XOR     DL,DL                   ; BACK TO COLUMN 0
21F7  8A E2                6189     C          MOV     AH,DL                   ; [AH]=0
21F9  52                   6190     C          PUSH    DX                      ; SAVE NEW CURSOR POSITION
21FA  E8 2220 R            6191     C          CALL    CRLF                    ; LINE FEED CARRIAGE RETURN
21FD  5A                   6192     C          POP     DX                      ; RECALL CURSOR POSITION
21FE  FE C6                6193     C          INC     DH                      ; ADVANCE TO NEXT LINE
2200  3A EE                6194     C          CMP     CH,DH                   ; FINISHED?
2202  75 D0                6195     C          JNZ     PRI10                   ; IF NOT CONTINUE
                           6196     C
2204  5A                   6197     C          POP     DX                      ; RECALL CURSOR POSITION
2205  B4 02                6198     C          MOV     AH,2                    ; TO INDICATE CURSOR SET REQUEST
2207  CD 10                6199     C          INT     10H                     ; CURSOR POSITION RESTORED
2209  C6 06 0500 R 00      6200     C          MOV     STATUS_BYTE,0           ; INDICATE FINISHED
220E  EB 0A                6201     C          JMP     SHORT EXIT              ; EXIT THE ROUTINE
2210                       6202     C  ERR10:
2210  5A                   6203     C          POP     DX                      ; GET CURSOR POSITION
2211  B4 02                6204     C          MOV     AH,2                    ; TO REQUEST CURSOR SET
2213  CD 10                6205     C          INT     10H                     ; CURSOR POSITION RESTORED
2215  C6 06 0500 R FF      6206     C          MOV     STATUS_BYTE,0FFH        ; INDICATE ERROR
221A                       6207     C  EXIT:
221A  5A                   6208     C          POP     DX                      ; RESTORE ALL THE REGISTERS USED
221B  59                   6209     C          POP     CX
221C  5B                   6210     C          POP     BX
221D  58                   6211     C          POP     AX
221E  1F                   6212     C          POP     DS
221F  CF                   6213     C          IRET
2220                       6214     C  PRINT_SCREEN    ENDP
                           6215     C
                           6216     C  ;----- CARRIAGE RETURN, LINE FEED SUBROUTINE
                           6217     C
2220                       6218     C  CRLF    PROC    NEAR
2220  33 D2                6219     C          XOR     DX,DX                   ; PRINTER 0
2222  32 E4                6220     C          XOR     AH,AH                   ; WILL NOW SEND INITIAL CR, LF
                           6221     C                                          ;  TO PRINTER
2224  B0 0D                6222     C          MOV     AL,0DH                  ; CR
2226  CD 17                6223     C          INT     17H                     ; SEND THE LINE FEED
2228  32 E4                6224     C          XOR     AH,AH                   ; NOW FOR THE CR
222A  B0 0A                6225     C          MOV     AL,0AH                  ; LF
222C  CD 17                6226     C          INT     17H                     ; SEND THE CARRIAGE RETURN
222E  C3                   6227     C          RET
222F                       6228     C  CRLF    ENDP
                           6229     C
                           6230     C          SUBTTL
                           6231
222F                       6232          CODE    ENDS
                           6233                  END


                           1                     PAGE,120
                           2                     SUBTTL  MONOCHROME CHARACTER GENERATOR
0000                       3          CODE    SEGMENT PUBLIC
                           4                  PUBLIC  CGMN
0000                       5          CGMN    LABEL   BYTE
                           6
0000  00 00 00 00 00 00    7                  DB      000H,000H,000H,000H,000H,000H,000H,000H ; TOP_HALF_00
      00 00
0008  00 00 00 00 00 00    9                  DB      000H,000H,000H,000H,000H,000H           ; BOTTOM_HALF 00
000E  00 00 7E 81 A5 81    10                 DB      000H,000H,07EH,081H,0A5H,081H,081H,0BDH ; TH_01
      81 BD
0016  99 81 7E 00 00 00    12                 DB      099H,081H,07EH,000H,000H,000H           ; BT_01
001C  00 00 7E FF DB FF    13                 DB      000H,000H,07EH,0FFH,0DBH,0FFH,0FFH,0C3H ; TH_02
      FF C3
0024  E7 FF 7E 00 00 00    15                 DB      0E7H,0FFH,07EH,000H,000H,000H           ; BT_02
002A  00 00 00 6C FE FE    16                 DB      000H,000H,000H,06CH,0FEH,0FEH,0FEH,0FEH ; TH_03
      FE FE
0032  7C 38 10 00 00 00    18                 DB      07CH,038H,010H,000H,000H,000H           ; BT_03
0038  00 00 00 10 38 7C    19                 DB      000H,000H,000H,010H,038H,07CH,0FEH,07CH ; TH_04
      FE 7C
0040  38 10 00 00 00 00    21                 DB      038H,010H,000H,000H,000H,000H           ; BT_04
0046  00 00 18 3C 3C E7    22                 DB      000H,000H,018H,03CH,03CH,0E7H,0E7H,0E7H ; TH_05
      E7 E7
004E  18 18 3C 00 00 00    24                 DB      018H,018H,03CH,000H,000H,000H           ; BT_05
0054  00 00 18 3C 7E FF    25                 DB      000H,000H,018H,03CH,07EH,0FFH,0FFH,07EH ; TH_06
      FF 7E
005C  18 18 3C 00 00 00    27                 DB      018H,018H,03CH,000H,000H,000H           ; BT_06
0062  00 00 00 00 00 18    28                 DB      000H,000H,000H,000H,000H,018H,03CH,03CH ; TH_07
      3C 3C
006A  18 00 00 00 00 00    30                 DB      018H,000H,000H,000H,000H,000H           ; BT_07
0070  FF FF FF FF FF E7    31                 DB      0FFH,0FFH,0FFH,0FFH,0FFH,0E7H,0C3H,0C3H ; TH_08
      C3 C3
0078  E7 FF FF FF FF FF    33                 DB      0E7H,0FFH,0FFH,0FFH,0FFH,0FFH           ; BT_08
007E  00 00 00 00 3C 66    34                 DB      000H,000H,000H,000H,03CH,066H,042H,042H ; TH_09
      42 42
0086  66 3C 00 00 00 00    36                 DB      066H,03CH,000H,000H,000H,000H           ; BT_09
008C  FF FF FF FF C3 99    37                 DB      0FFH,0FFH,0FFH,0FFH,0C3H,099H,0BDH,0BDH ; TH_0A
      BD BD
0094  99 C3 FF FF FF FF    39                 DB      099H,0C3H,0FFH,0FFH,0FFH,0FFH           ; BT_0A
009A  00 00 1E 0E 1A 32    40                 DB      000H,000H,01EH,00EH,01AH,032H,078H,0CCH ; TH_0B
      78 CC
00A2  CC CC 78 00 00 00    42                 DB      0CCH,0CCH,078H,000H,000H,000H           ; BT_0B
00A8  00 00 3C 66 66 66    43                 DB      000H,000H,03CH,066H,066H,066H,03CH,018H ; TH_0C
      3C 18
00B0  7E 18 18 00 00 00    45                 DB      07EH,018H,018H,000H,000H,000H           ; BT_0C
00B6  00 00 3F 33 3F 30    46                 DB      000H,000H,03FH,033H,03FH,030H,030H,030H ; TH_0D
      30 30
00BE  70 F0 E0 00 00 00    48                 DB      070H,0F0H,0E0H,000H,000H,000H           ; BT_0D
00C4  00 00 7F 63 7F 63    49                 DB      000H,000H,07FH,063H,07FH,063H,063H,063H ; TH_0E
      63 63
00CC  67 E7 E6 C0 00 00    51                 DB      067H,0E7H,0E6H,0C0H,000H,000H           ; BT_0E
00D2  00 00 18 18 DB 3C    52                 DB      000H,000H,018H,018H,0DBH,03CH,0E7H,03CH ; TH_0F
      E7 3C
00DA  DB 18 18 00 00 00    54                 DB      0DBH,018H,018H,000H,000H,000H           ; BT_0F
                           55
00E0  00 00 80 C0 E0 F8    56                 DB      000H,000H,080H,0C0H,0E0H,0F8H,0FEH,0F8H ; TH_10
      FE F8
00E8  E0 C0 80 00 00 00    58                 DB      0E0H,0C0H,080H,000H,000H,000H           ; BT_10
00EE  00 00 02 06 0E 3E    59                 DB      000H,000H,002H,006H,00EH,03EH,0FEH,03EH ; TH_11
      FE 3E
00F6  0E 06 02 00 00 00    61                 DB      00EH,006H,002H,000H,000H,000H           ; BT_11
00FC  00 00 18 3C 7E 18    62                 DB      000H,000H,018H,03CH,07EH,018H,018H,018H ; TH_12
      18 18
0104  7E 3C 18 00 00 00    64                 DB      07EH,03CH,018H,000H,000H,000H           ; BT_12
010A  00 00 66 66 66 66    65                 DB      000H,000H,066H,066H,066H,066H,066H,066H ; TH-13
```

```
        66 66                           66
0112    00 66 66 00 00 00               67              DB      000H,066H,066H,000H,000H,000H           ; BT_13
0118    00 00 7F DB DB DB               68              DB      000H,000H,07FH,0DBH,0DBH,0DBH,07BH,01BH ; TH_14
        7B 1B                           69
0120    1B 1B 1B 00 00 00               70              DB      01BH,01BH,01BH,000H,000H,000H           ; BT_14
0126    00 7C C6 60 38 6C               71              DB      000H,07CH,0C6H,060H,038H,06CH,0C6H,0C6H ; TH_15
        C6 C6                           72
012E    6C 38 0C C6 7C 00               73              DB      06CH,038H,00CH,0C6H,07CH,000H           ; BT_15
0134    00 00 00 00 00 00               74              DB      000H,000H,000H,000H,000H,000H,000H,000H ; TH_16
        00 00                           75
013C    FE FE FE 00 00 00               76              DB      0FEH,0FEH,0FEH,000H,000H,000H           ; BT_16
0142    00 00 18 3C 7E 18               77              DB      000H,000H,018H,03CH,07EH,018H,018H,018H ; TH_17
        18 18                           78
014A    7E 3C 18 7E 00 00               79              DB      07EH,03CH,018H,07EH,000H,000H           ; BT_17
0150    00 00 18 3C 7E 18               80              DB      000H,000H,018H,03CH,07EH,018H,018H,018H ; TH_18
        18 18                           81
0158    18 18 18 00 00 00               82              DB      018H,018H,018H,000H,000H,000H           ; BT_18
015E    00 00 18 18 18 18               83              DB      000H,000H,018H,018H,018H,018H,018H,018H ; TH_19
        18 18                           84
0166    7E 3C 18 00 00 00               85              DB      07EH,03CH,018H,000H,000H,000H           ; BT_19
016C    00 00 00 00 18 0C               86              DB      000H,000H,000H,000H,018H,00CH,0FEH,00CH ; TH_1A
        FE 0C                           87
0174    18 00 00 00 00 00               88              DB      018H,000H,000H,000H,000H,000H           ; BT_1A
017A    00 00 00 00 30 60               89              DB      000H,000H,000H,000H,030H,060H,0FEH,060H ; TH_1B
        FE 60                           90
0182    30 00 00 00 00 00               91              DB      030H,000H,000H,000H,000H,000H           ; BT_1B
0188    00 00 00 00 00 C0               92              DB      000H,000H,000H,000H,000H,0C0H,0C0H,0C0H ; TH_1C
        C0 C0                           93
0190    FE 00 00 00 00 00               94              DB      0FEH,000H,000H,000H,000H,000H           ; BT_1C
0196    00 00 00 00 28 6C               95              DB      000H,000H,000H,000H,028H,06CH,0FEH,06CH ; TH_1D
        FE 6C                           96
019E    28 00 00 00 00 00               97              DB      028H,000H,000H,000H,000H,000H           ; BT_1D
01A4    00 00 00 10 38 38               98              DB      000H,000H,000H,010H,038H,038H,07CH,07CH ; TH_1E
        7C 7C                           99
01AC    FE FE 00 00 00 00               100             DB      0FEH,0FEH,000H,000H,000H,000H           ; BT_1E
01B2    00 00 00 FE FE 7C               101             DB      000H,000H,000H,0FEH,0FEH,07CH,07CH,038H ; TH_1F
        7C 38                           102
01BA    38 10 00 00 00 00               103             DB      038H,010H,000H,000H,000H,000H           ; BT_1F
                                        104
01C0    00 00 00 00 00 00               105             DB      000H,000H,000H,000H,000H,000H,000H,000H ; TH_20 SP
        00 00                           106
01C8    00 00 00 00 00 00               107             DB      000H,000H,000H,000H,000H,000H           ; BT_20 SP
01CE    00 00 18 3C 3C 3C               108             DB      000H,000H,018H,03CH,03CH,03CH,018H,018H ; TH_21 !
        18 18                           109
01D6    00 18 18 00 00 00               110             DB      000H,018H,018H,000H,000H,000H           ; BT_21 !
01DC    00 66 66 66 24 00               111             DB      000H,066H,066H,066H,024H,000H,000H,000H ; TH_22 "
        00 00                           112
01E4    00 00 00 00 00 00               113             DB      000H,000H,000H,000H,000H,000H           ; BT_22 "
01EA    00 00 6C 6C FE 6C               114             DB      000H,000H,06CH,06CH,0FEH,06CH,06CH,06CH ; TH_23 %
        6C 6C                           115
01F2    FE 6C 6C 00 00 00               116             DB      0FEH,06CH,06CH,000H,000H,000H           ; BT_23 %
01F8    18 18 7C C6 C2 C0               117             DB      018H,018H,07CH,0C6H,0C2H,0C0H,07CH,006H ; TH_24 $
        7C 06                           118
0200    86 C6 7C 18 18 00               119             DB      086H,0C6H,07CH,018H,018H,000H           ; BT_24 $
0206    00 00 00 00 C2 C6               120             DB      000H,000H,000H,000H,0C2H,0C6H,00CH,018H ; TH_25 '%'
        0C 18                           121
020E    30 66 C6 00 00 00               122             DB      030H,066H,0C6H,000H,000H,000H           ; BT_25 '%'
0214    00 00 38 6C 6C 38               123             DB      000H,000H,038H,06CH,06CH,038H,076H,0DCH ; TH_26 &
        76 DC                           124
021C    CC CC 76 00 00 00               125             DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_26 &
0222    00 30 30 30 60 00               126             DB      000H,030H,030H,030H,060H,000H,000H,000H ; TH_27 '
        00 00                           127
022A    00 00 00 00 00 00               128             DB      000H,000H,000H,000H,000H,000H           ; BT_27 '
0230    00 00 0C 18 30 30               129             DB      000H,000H,00CH,018H,030H,030H,030H,030H ; TH_28 (
        30 30                           130
0238    30 18 0C 00 00 00               131             DB      030H,018H,00CH,000H,000H,000H           ; BT_28 (
023E    00 00 30 18 0C 0C               132             DB      000H,000H,030H,018H,00CH,00CH,00CH,00CH ; TH_29 )
        0C 0C                           133
0246    0C 18 30 00 00 00               134             DB      00CH,018H,030H,000H,000H,000H           ; BT_29 )
024C    00 00 00 00 66 3C               135             DB      000H,000H,000H,000H,066H,03CH,0FFH,03CH ; TH_2A *
        FF 3C                           136
0254    66 00 00 00 00 00               137             DB      066H,000H,000H,000H,000H,000H           ; BT_2A *
025A    00 00 00 00 18 18               138             DB      000H,000H,000H,000H,018H,018H,07EH,018H ; TH_2B +
        7E 18                           139
0262    18 00 00 00 00 00               140             DB      018H,000H,000H,000H,000H,000H           ; BT_2B +
0268    00 00 00 00 00 00               141             DB      000H,000H,000H,000H,000H,000H,000H,000H ; TH_2C ,
        00 00                           142
0270    18 18 18 30 00 00               143             DB      018H,018H,018H,030H,000H,000H           ; BT_2C ,
0276    00 00 00 00 00 00               144             DB      000H,000H,000H,000H,000H,000H,0FEH,000H ; TH_2D -
        FE 00                           145
027E    00 00 00 00 00 00               146             DB      000H,000H,000H,000H,000H,000H           ; BT_2D -
0284    00 00 00 00 00 00               147             DB      000H,000H,000H,000H,000H,000H,000H,000H ; TH_2E .
        00 00                           148
028C    00 18 18 00 00 00               149             DB      000H,018H,018H,000H,000H,000H           ; BT_2E .
0292    00 00 02 06 0C 18               150             DB      000H,000H,002H,006H,00CH,018H,030H,060H ; TH_2F /
        30 60                           151
029A    C0 80 00 00 00 00               152             DB      0C0H,080H,000H,000H,000H,000H           ; BT_2F /
                                        153
02A0    00 00 7C C6 CE DE               154             DB      000H,000H,07CH,0C6H,0CEH,0DEH,0F6H,0E6H ; TH_30 0
        F6 E6                           155
02A8    C6 C6 7C 00 00 00               156             DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_30 0
02AE    00 00 18 38 78 18               157             DB      000H,000H,018H,038H,078H,018H,018H,018H ; TH_31 1
        18 18                           158
02B6    18 18 7E 00 00 00               159             DB      018H,018H,07EH,000H,000H,000H           ; BT_31 1
02BC    00 00 7C C6 06 0C               160             DB      000H,000H,07CH,0C6H,006H,00CH,018H,030H ; TH_32 2
        18 30                           161
02C4    60 C6 FE 00 00 00               162             DB      060H,0C6H,0FEH,000H,000H,000H           ; BT_32 2
02CA    00 00 7C C6 06 06               163             DB      000H,000H,07CH,0C6H,006H,006H,03CH,006H ; TH_33 3
        3C 06                           164
02D2    06 C6 7C 00 00 00               165             DB      006H,0C6H,07CH,000H,000H,000H           ; BT_33 3
02D8    00 00 0C 1C 3C 6C               166             DB      000H,000H,00CH,01CH,03CH,06CH,0CCH,0FEH ; TH_34 4
        CC FE                           167
02E0    0C 0C 1E 00 00 00               168             DB      00CH,00CH,01EH,000H,000H,000H           ; BT_34 4
02E6    00 00 FE C0 C0 C0               169             DB      000H,000H,0FEH,0C0H,0C0H,0C0H,0FCH,006H ; TH_35 5
        FC 06                           170
02EE    06 C6 7C 00 00 00               171             DB      006H,0C6H,07CH,000H,000H,000H           ; BT_35 5
02F4    00 00 38 60 C0 C0               172             DB      000H,000H,038H,060H,0C0H,0C0H,0FCH,0C6H ; TH_36 6
        FC C6                           173
02FC    C6 C6 7C 00 00 00               174             DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_36 6
0302    00 00 FE C6 06 0C               175             DB      000H,000H,0FEH,0C6H,006H,00CH,018H,030H ; TH_37 7
        18 30                           176
030A    30 30 30 00 00 00               177             DB      030H,030H,030H,000H,000H,000H           ; BT_37 7
0310    00 00 7C C6 C6 C6               178             DB      000H,000H,07CH,0C6H,0C6H,0C6H,07CH,0C6H ; TH_38 8
        7C C6                           179
0318    C6 C6 7C 00 00 00               180             DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_38 8
031E    00 00 7C C6 C6 C6               181             DB      000H,000H,07CH,0C6H,0C6H,0C6H,07EH,006H ; TH_39 9
        7E 06                           182
0326    06 0C 78 00 00 00               183             DB      006H,00CH,078H,000H,000H,000H           ; BT_39 9
032C    00 00 00 18 18 00               184             DB      000H,000H,000H,018H,018H,000H,000H,000H ; TH_3A :
        00 00                           185
0334    18 18 00 00 00 00               186             DB      018H,018H,000H,000H,000H,000H           ; BT_3A :
033A    00 00 00 18 18 00               187             DB      000H,000H,000H,018H,018H,000H,000H,000H ; TH_3B ;
        00 00                           188
0342    18 18 30 00 00 00               189             DB      018H,018H,030H,000H,000H,000H           ; BT_3B ;
0348    00 00 06 0C 18 30               190             DB      000H,000H,006H,00CH,018H,030H,060H,030H ; TH_3C <
        60 30                           191
```

```
0350  18 0C 06 00 00 00      192                DB      018H,00CH,006H,000H,000H,000H           ; BT_3C <
0356  00 00 00 00 00 7E      193                DB      000H,000H,000H,000H,000H,07EH,000H,000H ; TH_3D =
      00 00                  194
035E  7E 00 00 00 00 00      195                DB      07EH,000H,000H,000H,000H,000H           ; BT_3D =
0364  00 00 60 30 18 0C      196                DB      000H,000H,060H,030H,018H,00CH,006H,00CH ; TH_3E >
      06 0C                  197
036C  18 30 60 00 00 00      198                DB      018H,030H,060H,000H,000H,000H           ; BT_3E >
0372  00 00 7C C6 C6 0C      199                DB      000H,000H,07CH,0C6H,0C6H,00CH,018H,018H ; TH_3F ?
      18 18                  200
037A  00 18 18 00 00 00      201                DB      000H,018H,018H,000H,000H,000H           ; BT_3F ?
                             202
0380  00 00 7C C6 C6 DE      203                DB      000H,000H,07CH,0C6H,0C6H,0DEH,0DEH,0DEH ; TH_40 @
      DE DE                  204
0388  DC C0 7C 00 00 00      205                DB      0DCH,0C0H,07CH,000H,000H,000H           ; BT_40 @
038E  00 00 10 38 6C C6      206                DB      000H,000H,010H,038H,06CH,0C6H,0C6H,0FEH ; TH_41 A
      C6 FE                  207
0396  C6 C6 C6 00 00 00      208                DB      0C6H,0C6H,0C6H,000H,000H,000H           ; BT_41 A
039C  00 00 FC 66 66 66      209                DB      000H,000H,0FCH,066H,066H,066H,07CH,066H ; TH_42 B
      7C 66                  210
03A4  66 66 FC 00 00 00      211                DB      066H,066H,0FCH,000H,000H,000H           ; BT_42 B
03AA  00 00 3C 66 C2 C0      212                DB      000H,000H,03CH,066H,0C2H,0C0H,0C0H,0C0H ; TH_43 C
      C0 C0                  213
03B2  C2 66 3C 00 00 00      214                DB      0C2H,066H,03CH,000H,000H,000H           ; BT_43 C
03B8  00 00 F8 6C 66 66      215                DB      000H,000H,0F8H,06CH,066H,066H,066H,066H ; TH_44 D
      66 66                  216
03C0  66 6C F8 00 00 00      217                DB      066H,06CH,0F8H,000H,000H,000H           ; BT_44 D
03C6  00 00 FE 66 62 68      218                DB      000H,000H,0FEH,066H,062H,068H,078H,068H ; TH_45 E
      78 68                  219
03CE  62 66 FE 00 00 00      220                DB      062H,066H,0FEH,000H,000H,000H           ; BT_45 E
03D4  00 00 FE 66 62 68      221                DB      000H,000H,0FEH,066H,062H,068H,078H,068H ; TH_46 F
      78 68                  222
03DC  60 60 F0 00 00 00      223                DB      060H,060H,0F0H,000H,000H,000H           ; BT_46 F
03E2  00 00 3C 66 C2 C0      224                DB      000H,000H,03CH,066H,0C2H,0C0H,0C0H,0DEH ; TH_47 G
      C0 DE                  225
03EA  C6 66 3A 00 00 00      226                DB      0C6H,066H,03AH,000H,000H,000H           ; BT_47 G
03F0  00 00 C6 C6 C6 C6      227                DB      000H,000H,0C6H,0C6H,0C6H,0C6H,0FEH,0C6H ; TH_48 H
      FE C6                  228
03F8  C6 C6 C6 00 00 00      229                DB      0C6H,0C6H,0C6H,000H,000H,000H           ; BT_48 H
03FE  00 00 3C 18 18 18      230                DB      000H,000H,03CH,018H,018H,018H,018H,018H ; TH_49 I
      18 18                  231
0406  18 18 3C 00 00 00      232                DB      018H,018H,03CH,000H,000H,000H           ; BT_49 I
040C  00 00 1E 0C 0C 0C      233                DB      000H,000H,01EH,00CH,00CH,00CH,00CH,00CH ; TH_4A J
      0C 0C                  234
0414  CC CC 78 00 00 00      235                DB      0CCH,0CCH,078H,000H,000H,000H           ; BT_4A J
041A  00 00 E6 66 6C 6C      236                DB      000H,000H,0E6H,066H,06CH,06CH,078H,06CH ; TH_4B K
      78 6C                  237
0422  6C 66 E6 00 00 00      238                DB      06CH,066H,0E6H,000H,000H,000H           ; BT_4B K
0428  00 00 F0 60 60 60      239                DB      000H,000H,0F0H,060H,060H,060H,060H,060H ; TH_4C L
      60 60                  240
0430  62 66 FE 00 00 00      241                DB      062H,066H,0FEH,000H,000H,000H           ; BT_AC L
0436  00 00 C6 EE FE FE      242                DB      000H,000H,0C6H,0EEH,0FEH,0FEH,0D6H,0C6H ; TH_4D M
      D6 C6                  243
043E  C6 C6 C6 00 00 00      244                DB      0C6H,0C6H,0C6H,000H,000H,000H           ; BT_4D M
0444  00 00 C6 E6 F6 FE      245                DB      000H,000H,0C6H,0E6H,0F6H,0FEH,0DEH,0CEH ; TH_4E N
      DE CE                  246
044C  C6 C6 C6 00 00 00      247                DB      0C6H,0C6H,0C6H,000H,000H,000H           ; BT_4E N
0452  00 00 38 6C C6 C6      248                DB      000H,000H,038H,06CH,0C6H,0C6H,0C6H,0C6H ; TH_4F O
      C6 C6                  249
045A  C6 6C 38 00 00 00      250                DB      0C6H,06CH,038H,000H,000H,000H           ; BT_4F O
                             251
0460  00 00 FC 66 66 66      252                DB      000H,000H,0FCH,066H,066H,066H,07CH,060H ; TH_50 P
      7C 60                  253
0468  60 60 F0 00 00 00      254                DB      060H,060H,0F0H,000H,000H,000H           ; BT_50 P
046E  00 00 7C C6 C6 C6      255                DB      000H,000H,07CH,0C6H,0C6H,0C6H,0C6H,0D6H ; TH_51 Q
      C6 D6                  256
0476  DE 7C 0C 0E 00 00      257                DB      0DEH,07CH,00CH,00EH,000H,000H           ; BT_51 Q
047C  00 00 FC 66 66 66      258                DB      000H,000H,0FCH,066H,066H,066H,07CH,06CH ; TH_52 R
      7C 6C                  259
0484  66 66 E6 00 00 00      260                DB      066H,066H,0E6H,000H,000H,000H           ; BT_52 R
048A  00 00 7C C6 C6 60      261                DB      000H,000H,07CH,0C6H,0C6H,060H,038H,00CH ; TH_53 S
      38 0C                  262
0492  C6 C6 7C 00 00 00      263                DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_53 S
0498  00 00 7E 7E 5A 18      264                DB      000H,000H,07EH,07EH,05AH,018H,018H,018H ; TH_54 T
      18 18                  265
04A0  18 18 3C 00 00 00      266                DB      018H,018H,03CH,000H,000H,000H           ; BT_54 T
04A6  00 00 C6 C6 C6 C6      267                DB      000H,000H,0C6H,0C6H,0C6H,0C6H,0C6H,0C6H ; TH_55 U
      C6 C6                  268
04AE  C6 C6 7C 00 00 00      269                DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_55 U
04B4  00 00 C6 C6 C6 C6      270                DB      000H,000H,0C6H,0C6H,0C6H,0C6H,0C6H,0C6H ; TH_56 V
      C6 C6                  271
04BC  6C 38 10 00 00 00      272                DB      06CH,038H,010H,000H,000H,000H           ; BT_56 V
04C2  00 00 C6 C6 C6 C6      273                DB      000H,000H,0C6H,0C6H,0C6H,0C6H,0D6H,0D6H ; TH_57 W
      D6 D6                  274
04CA  FE 7C 6C 00 00 00      275                DB      0FEH,07CH,06CH,000H,000H,000H           ; BT_57 W
04D0  00 00 C6 C6 6C 38      276                DB      000H,000H,0C6H,0C6H,06CH,038H,038H,038H ; TH_58 X
      38 38                  277
04D8  6C C6 C6 00 00 00      278                DB      06CH,0C6H,0C6H,000H,000H,000H           ; BT_58 X
04DE  00 00 66 66 66 66      279                DB      000H,000H,066H,066H,066H,066H,03CH,018H ; TH_59 Y
      3C 18                  280
04E6  18 18 3C 00 00 00      281                DB      018H,018H,03CH,000H,000H,000H           ; BT_59 Y
04EC  00 00 FE C6 8C 18      282                DB      000H,000H,0FEH,0C6H,08CH,018H,030H,060H ; TH_5A Z
      30 60                  283
04F4  C2 C6 FE 00 00 00      284                DB      0C2H,0C6H,0FEH,000H,000H,000H           ; BT_5A Z
04FA  00 00 3C 30 30 30      285                DB      000H,000H,03CH,030H,030H,030H,030H,030H ; TH_5B [
      30 30                  286
0502  30 30 3C 00 00 00      287                DB      030H,030H,03CH,000H,000H,000H           ; BT_5B [
0508  00 00 80 C0 E0 70      288                DB      000H,000H,080H,0C0H,0E0H,070H,038H,01CH ; TH_5C
      38 1C                  289
0510  0E 06 02 00 00 00      290                DB      00EH,006H,002H,000H,000H,000H           ; BT_5C
0516  00 00 3C 0C 0C 0C      291                DB      000H,000H,03CH,00CH,00CH,00CH,00CH,00CH ; TH_5D ]
      0C 0C                  292
051E  0C 0C 3C 00 00 00      293                DB      00CH,00CH,03CH,000H,000H,000H           ; BT_5D ]
0524  10 38 6C C6 00 00      294                DB      010H,038H,06CH,0C6H,000H,000H,000H,000H ; TH_5E
      00 00                  295
052C  00 00 00 00 00 00      296                DB      000H,000H,000H,000H,000H,000H           ; BT_5E
0532  00 00 00 00 00 00      297                DB      000H,000H,000H,000H,000H,000H,000H,000H ; TH_5F _
      00 00                  298
053A  00 00 00 00 FF 00      299                DB      000H,000H,000H,000H,0FFH,000H           ; BT_5F _
                             300
0540  30 30 18 00 00 00      301                DB      030H,030H,018H,000H,000H,000H,000H,000H ; TH_60 `
      00 00                  302
0548  00 00 00 00 00 00      303                DB      000H,000H,000H,000H,000H,000H           ; BT_60 `
054E  00 00 00 00 00 78      304                DB      000H,000H,000H,000H,000H,078H,00CH,07CH ; TH_61 LOWER_CASE A
      0C 7C                  305
0556  CC CC 76 00 00 00      306                DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_61 LOWER_CASE A
055C  00 00 E0 60 60 78      307                DB      000H,000H,0E0H,060H,060H,078H,06CH,066H ; TH_62 L.C. B
      6C 66                  308
0564  66 66 7C 00 00 00      309                DB      066H,066H,07CH,000H,000H,000H           ; BT_62 L.C. B
056A  00 00 00 00 00 7C      310                DB      000H,000H,000H,000H,000H,07CH,0C6H,0C0H ; TH_63 L.C. C
      C6 C0                  311
0572  C0 C6 7C 00 00 00      312                DB      0C0H,0C6H,07CH,000H,000H,000H           ; BT_63 L.C. C
0578  00 00 1C 0C 0C 3C      313                DB      000H,000H,01CH,00CH,00CH,03CH,06CH,0CCH ; TH_64 L.C. D
      6C CC                  314
0580  CC CC 76 00 00 00      315                DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_64 L.C. D
0586  00 00 00 00 00 7C      316                DB      000H,000H,000H,000H,000H,07CH,0C6H,0FEH ; TH_65 L.C. E
      C6 FE                  317
```

```
058E  C0 C6 7C 00 00 00      318          DB      0C0H,0C6H,07CH,000H,000H,000H           ; BT_65 L.C. E
0594  00 00 38 6C 64 60      319          DB      000H,000H,038H,06CH,064H,060H,0F0H,060H ; TH_66 L.C. F
      F0 60                  320
059C  60 60 F0 00 00 00      321          DB      060H,060H,0F0H,000H,000H,000H           ; BT_66 L.C. F
05A2  00 00 00 00 00 76      322          DB      000H,000H,000H,000H,000H,076H,0CCH,0CCH ; TH_67 L.C. G
      CC CC                  323
05AA  CC 7C 0C CC 78 00      324          DB      0CCH,07CH,00CH,0CCH,078H,000H           ; BT_67 L.C. G
05B0  00 00 E0 60 60 6C      325          DB      000H,000H,0E0H,060H,060H,06CH,076H,066H ; TH_68 L.C. H
      76 66                  326
05B8  66 66 E6 00 00 00      327          DB      066H,066H,0E6H,000H,000H,000H           ; BT_68 L.C. H
05BE  00 00 18 18 00 38      328          DB      000H,000H,018H,018H,000H,038H,018H,018H ; TH_69 L.C. I
      18 18                  329
05C6  18 18 3C 00 00 00      330          DB      018H,018H,03CH,000H,000H,000H           ; BT_69 L.C. I
05CC  00 00 06 06 00 0E      331          DB      000H,000H,006H,006H,000H,00EH,006H,006H ; TH_6A L.C. J
      06 06                  332
05D4  06 06 66 66 3C 00      333          DB      006H,006H,066H,066H,03CH,000H           ; BT_6A L.C. J
05DA  00 00 E0 60 60 66      334          DB      000H,000H,0E0H,060H,060H,066H,06CH,078H ; TH_6B L.C. K
      6C 78                  335
05E2  6C 66 E6 00 00 00      336          DB      06CH,066H,0E6H,000H,000H,000H           ; BT_6B L.C. K
05E8  00 00 38 18 18 18      337          DB      000H,000H,038H,018H,018H,018H,018H,018H ; TH_6C L.C. L
      18 18                  338
05F0  18 18 3C 00 00 00      339          DB      018H,018H,03CH,000H,000H,000H           ; BT_6C L.C. L
05F6  00 00 00 00 00 EC      340          DB      000H,000H,000H,000H,000H,0ECH,0FEH,0D6H ; TH_6D L.C. M
      FE D6                  341
05FE  D6 D6 C6 00 00 00      342          DB      0D6H,0D6H,0C6H,000H,000H,000H           ; BT_6D L.C. M
0604  00 00 00 00 00 DC      343          DB      000H,000H,000H,000H,000H,0DCH,066H,066H ; TH_6E L.C. N
      66 66                  344
060C  66 66 66 00 00 00      345          DB      066H,066H,066H,000H,000H,000H           ; BT_6E L.C. N
0612  00 00 00 00 00 7C      346          DB      000H,000H,000H,000H,000H,07CH,0C6H,0C6H ; TH_6F L.C. O
      C6 C6                  347
061A  C6 C6 7C 00 00 00      348          DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_6F L.C. O
                             349
0620  00 00 00 00 00 DC      350          DB      000H,000H,000H,000H,000H,0DCH,066H,066H ; TH_70 L.C. P
      66 66                  351
0628  66 7C 60 60 F0 00      352          DB      066H,07CH,060H,060H,0F0H,000H           ; BT_70 L.C. P
062E  00 00 00 00 00 76      353          DB      000H,000H,000H,000H,000H,076H,0CCH,0CCH ; TH_71 L.C. Q
      CC CC                  354
0636  CC 7C 0C 0C 1E 00      355          DB      0CCH,07CH,00CH,00CH,01EH,000H           ; BT_71 L.C. Q
063C  00 00 00 00 00 DC      356          DB      000H,000H,000H,000H,000H,0DCH,076H,066H ; TH_72 L.C. R
      76 66                  357
0644  60 60 F0 00 00 00      358          DB      060H,060H,0F0H,000H,000H,000H           ; BT_72 L.C. R
064A  00 00 00 00 00 7C      359          DB      000H,000H,000H,000H,000H,07CH,0C6H,070H ; TH_73 L.C. S
      C6 70                  360
0652  1C C6 7C 00 00 00      361          DB      01CH,0C6H,07CH,000H,000H,000H           ; BT_73 L.C. S
0658  00 00 10 30 30 FC      362          DB      000H,000H,010H,030H,030H,0FCH,030H,030H ; TH_74 L.C. T
      30 30                  363
0660  30 36 1C 00 00 00      364          DB      030H,036H,01CH,000H,000H,000H           ; BT_74 L.C. T
0666  00 00 00 00 00 CC      365          DB      000H,000H,000H,000H,000H,0CCH,0CCH,0CCH ; TH_75 L.C. U
      CC CC                  366
066E  CC CC 76 00 00 00      367          DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_75 L.C. Y
0674  00 00 00 00 00 66      368          DB      000H,000H,000H,000H,000H,066H,066H,066H ; TH_76 L.C. V
      66 66                  369
067C  66 3C 18 00 00 00      370          DB      066H,03CH,018H,000H,000H,000H           ; BT_76 L.C. V
0682  00 00 00 00 00 C6      371          DB      000H,000H,000H,000H,000H,0C6H,0C6H,0D6H ; TH_77 L.C. W
      C6 D6                  372
068A  D6 FE 6C 00 00 00      373          DB      0D6H,0FEH,06CH,000H,000H,000H           ; BT_77 L.C. W
0690  00 00 00 00 00 C6      374          DB      000H,000H,000H,000H,000H,0C6H,06CH,038H ; TH_78 L.C. X
      6C 38                  375
0698  38 6C C6 00 00 00      376          DB      038H,06CH,0C6H,000H,000H,000H           ; BT_78 L.C. X
069E  00 00 00 00 00 C6      377          DB      000H,000H,000H,000H,000H,0C6H,0C6H,0C6H ; TH_79 L.C. Y
      C6 C6                  378
06A6  C6 7E 06 0C F8 00      379          DB      0C6H,07EH,006H,00CH,0F8H,000H           ; BT_79 L.C. Y
06AC  00 00 00 00 00 FE      380          DB      000H,000H,000H,000H,000H,0FEH,0CCH,018H ; TH_7A L.C. Z
      CC 18                  381
06B4  30 66 FE 00 00 00      382          DB      030H,066H,0FEH,000H,000H,000H           ; BT_7A L.C. Z
06BA  00 00 0E 18 18 18      383          DB      000H,000H,00EH,018H,018H,018H,070H,018H ; TH_7B L BRAK
      70 18                  384
06C2  18 18 0E 00 00 00      385          DB      018H,018H,00EH,000H,000H,000H           ; BT_7B L BRAK
06C8  00 00 18 18 18 18      386          DB      000H,000H,018H,018H,018H,018H,000H,018H ; TH_7C |
      00 18                  387
06D0  18 18 18 00 00 00      388          DB      018H,018H,018H,000H,000H,000H           ; BT_7C |
06D6  00 00 70 18 18 18      389          DB      000H,000H,070H,018H,018H,018H,00EH,018H ; TH_7D R BRAK
      0E 18                  390
06DE  18 18 70 00 00 00      391          DB      018H,018H,070H,000H,000H,000H           ; BT_7D R BRAK
06E4  00 00 76 DC 00 00      392          DB      000H,000H,076H,0DCH,000H,000H,000H,000H ; TH_7E TILDE
      00 00                  393
06EC  00 00 00 00 00 00      394          DB      000H,000H,000H,000H,000H,000H           ; BT_7E TILDE
06F2  00 00 00 00 10 38      395          DB      000H,000H,000H,000H,010H,038H,06CH,0C6H ; TH_7F DELTA
      6C C6                  396
06FA  C6 FE 00 00 00 00      397          DB      0C6H,0FEH,000H,000H,000H,000H           ; BT_7F DELTA
                             398
0700  00 00 3C 66 C2 C0      399          DB      000H,000H,03CH,066H,0C2H,0C0H,0C0H,0C2H ; TH_80
      C0 C2                  400
0708  66 3C 0C 06 7C 00      401          DB      066H,03CH,00CH,006H,07CH,000H           ; BT_80
070E  00 00 CC CC 00 CC      402          DB      000H,000H,0CCH,0CCH,000H,0CCH,0CCH,0CCH ; TH_81
      CC CC                  403
0716  CC CC 76 00 00 00      404          DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_81
071C  00 0C 18 30 00 7C      405          DB      000H,00CH,018H,030H,000H,07CH,0C6H,0FEH ; TH_82
      C6 FE                  406
0724  C0 C6 7C 00 00 00      407          DB      0C0H,0C6H,07CH,000H,000H,000H           ; BT_82
072A  00 10 38 6C 00 78      408          DB      000H,010H,038H,06CH,000H,078H,00CH,07CH ; TH_83
      0C 7C                  409
0732  CC CC 76 00 00 00      410          DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_83
0738  00 00 CC CC 00 78      411          DB      000H,000H,0CCH,0CCH,000H,078H,00CH,07CH ; TH_84
      0C 7C                  412
0740  CC CC 76 00 00 00      413          DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_84
0746  00 60 30 18 00 78      414          DB      000H,060H,030H,018H,000H,078H,00CH,07CH ; TH_85
      0C 7C                  415
074E  CC CC 76 00 00 00      416          DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_85
0754  00 38 6C 38 00 78      417          DB      000H,038H,06CH,038H,000H,078H,00CH,07CH ; TH_86
      0C 7C                  418
075C  CC CC 76 00 00 00      419          DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_86
0762  00 00 00 00 3C 66      420          DB      000H,000H,000H,000H,03CH,066H,060H,066H ; TH_87
      60 66                  421
076A  3C 0C 06 3C 00 00      422          DB      03CH,00CH,006H,03CH,000H,000H           ; BT_87
0770  00 10 38 6C 00 7C      423          DB      000H,010H,038H,06CH,000H,07CH,0C6H,0FEH ; TH_88
      C6 FE                  424
0778  C0 C6 7C 00 00 00      425          DB      0C0H,0C6H,07CH,000H,000H,000H           ; BT_88
077E  00 00 CC CC 00 7C      426          DB      000H,000H,0CCH,0CCH,000H,07CH,0C6H,0FEH ; TH_89
      C6 FE                  427
0786  C0 C6 7C 00 00 00      428          DB      0C0H,0C6H,07CH,000H,000H,000H           ; BT_89
078C  00 60 30 18 00 7C      429          DB      000H,060H,030H,018H,000H,07CH,0C6H,0FEH ; TH_8A
      C6 FE                  430
0794  C0 C6 7C 00 00 00      431          DB      0C0H,0C6H,07CH,000H,000H,000H           ; BT_8A
079A  00 00 66 66 00 38      432          DB      000H,000H,066H,066H,000H,038H,018H,018H ; TH_8B
      18 18                  433
07A2  18 18 3C 00 00 00      434          DB      018H,018H,03CH,000H,000H,000H           ; BT_8B
07A8  00 18 3C 66 00 38      435          DB      000H,018H,03CH,066H,000H,038H,018H,018H ; TH_8C
      18 18                  436
07B0  18 18 3C 00 00 00      437          DB      018H,018H,03CH,000H,000H,000H           ; BT_8C
07B6  00 60 30 18 00 38      438          DB      000H,060H,030H,018H,000H,038H,018H,018H ; TH_8D
      18 18                  439
07BE  18 18 3C 00 00 00      440          DB      018H,018H,03CH,000H,000H,000H           ; BT_8D
07C4  00 C6 C6 10 38 6C      441          DB      000H,0C6H,0C6H,010H,038H,06CH,0C6H,0C6H ; TH_8E
      C6 C6                  442
07CC  FE C6 C6 00 00 00      443          DB      0FEH,0C6H,0C6H,000H,000H,000H           ; BT_8E
```

```
07D2  38 6C 38 00 38 6C      444                DB      038H,06CH,038H,000H,038H,06CH,0C6H,0C6H ; TH_8F
      C6 C6                  445
07DA  FE C6 C6 00 00 00      446                DB      0FEH,0C6H,0C6H,000H,000H,000H           ; BT_8F
                             447
07E0  18 30 60 00 FE 66      448                DB      018H,030H,060H,000H,0FEH,066H,060H,07CH ; TH_90
      60 7C                  449
07E8  60 66 FE 00 00 00      450                DB      060H,066H,0FEH,000H,000H,000H           ; BT_90
07EE  00 00 00 00 CC 76      451                DB      000H,000H,000H,000H,0CCH,076H,036H,07EH ; TH_91
      36 7E                  452
07F6  D8 D8 6E 00 00 00      453                DB      0D8H,0D8H,06EH,000H,000H,000H           ; BT_91
07FC  00 00 3E 6C CC CC      454                DB      000H,000H,03EH,06CH,0CCH,0CCH,0FEH,0CCH ; TH_92
      FE CC                  455
0804  CC CC CE 00 00 00      456                DB      0CCH,0CCH,0CEH,000H,000H,000H           ; BT_92
080A  00 10 38 6C 00 7C      457                DB      000H,010H,038H,06CH,000H,07CH,0C6H,0C6H ; TH_93
      C6 C6                  458
0812  C6 C6 7C 00 00 00      459                DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_93
0818  00 00 C6 C6 00 7C      460                DB      000H,000H,0C6H,0C6H,000H,07CH,0C6H,0C6H ; TH_94
      C6 C6                  461
0820  C6 C6 7C 00 00 00      462                DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_94
0826  00 60 30 18 00 7C      463                DB      000H,060H,030H,018H,000H,07CH,0C6H,0C6H ; TH_95
      C6 C6                  464
082E  C6 C6 7C 00 00 00      465                DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_95
0834  00 30 78 CC 00 CC      466                DB      000H,030H,078H,0CCH,000H,0CCH,0CCH,0CCH ; TH_96
      CC CC                  467
083C  CC CC 76 00 00 00      468                DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_96
0842  00 60 30 18 00 CC      469                DB      000H,060H,030H,018H,000H,0CCH,0CCH,0CCH ; TH_97
      CC CC                  470
084A  CC CC 76 00 00 00      471                DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_97
0850  00 00 C6 C6 00 C6      472                DB      000H,000H,0C6H,0C6H,000H,0C6H,0C6H,0C6H ; TH_98
      C6 C6                  473
0858  C6 7E 06 0C 78 00      474                DB      0C6H,07EH,006H,00CH,078H,000H           ; BT_98
085E  00 C6 C6 38 6C C6      475                DB      000H,0C6H,0C6H,038H,06CH,0C6H,0C6H,0C6H ; TH_99
      C6 C6                  476
0866  C6 6C 38 00 00 00      477                DB      0C6H,06CH,038H,000H,000H,000H           ; BT_99
086C  00 C6 C6 00 C6 C6      478                DB      000H,0C6H,0C6H,000H,0C6H,0C6H,0C6H,0C6H ; TH_9A
      C6 C6                  479
0874  C6 C6 7C 00 00 00      480                DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_9A
087A  00 18 18 3C 66 60      481                DB      000H,018H,018H,03CH,066H,060H,060H,066H ; TH_9B
      60 66                  482
0882  3C 18 18 00 00 00      483                DB      03CH,018H,018H,000H,000H,000H           ; BT_9B
0888  00 38 6C 64 60 F0      484                DB      000H,038H,06CH,064H,060H,0F0H,060H,060H ; TH_9C
      60 60                  485
0890  60 E6 FC 00 00 00      486                DB      060H,0E6H,0FCH,000H,000H,000H           ; BT_9C
0896  00 00 66 66 3C 18      487                DB      000H,000H,066H,066H,03CH,018H,07EH,018H ; TH_9D
      7E 18                  488
089E  7E 18 18 00 00 00      489                DB      07EH,018H,018H,000H,000H,000H           ; BT_9D
08A4  00 F8 CC CC F8 C4      490                DB      000H,0F8H,0CCH,0CCH,0F8H,0C4H,0CCH,0DEH ; TH_9E
      CC DE                  491
08AC  CC CC C6 00 00 00      492                DB      0CCH,0CCH,0C6H,000H,000H,000H           ; BT_9E
08B2  00 0E 1B 18 18 18      493                DB      000H,00EH,01BH,018H,018H,018H,07EH,018H ; TH_9F
      7E 18                  494
08BA  18 18 18 D8 70 00      495                DB      018H,018H,018H,0D8H,070H,000H           ; BT_9F
                             496
08C0  00 18 30 60 00 78      497                DB      000H,018H,030H,060H,000H,078H,00CH,07CH ; TH_A0
      0C 7C                  498
08C8  CC CC 76 00 00 00      499                DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_A0
08CE  00 0C 18 30 00 38      500                DB      000H,00CH,018H,030H,000H,038H,018H,018H ; TH_A1
      18 18                  501
08D6  18 18 3C 00 00 00      502                DB      018H,018H,03CH,000H,000H,000H           ; BT_A1
08DC  00 18 30 60 00 7C      503                DB      000H,018H,030H,060H,000H,07CH,0C6H,0C6H ; TH_A2
      C6 C6                  504
08E4  C6 C6 7C 00 00 00      505                DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_A2
08EA  00 18 30 60 00 CC      506                DB      000H,018H,030H,060H,000H,0CCH,0CCH,0CCH ; TH_A3
      CC CC                  507
08F2  CC CC 76 00 00 00      508                DB      0CCH,0CCH,076H,000H,000H,000H           ; BT_A3
08F8  00 00 76 DC 00 DC      509                DB      000H,000H,076H,0DCH,000H,0DCH,066H,066H ; TH_A4
      66 66                  510
0900  66 66 66 00 00 00      511                DB      066H,066H,066H,000H,000H,000H           ; BT_A4
0906  76 DC 00 C6 E6 F6      512                DB      076H,0DCH,000H,0C6H,0E6H,0F6H,0FEH,0DEH ; TH_A5
      FE DE                  513
090E  CE C6 C6 00 00 00      514                DB      0CEH,0C6H,0C6H,000H,000H,000H           ; BT_A5
0914  00 3C 6C 6C 3E 00      515                DB      000H,03CH,06CH,06CH,03EH,000H,07EH,000H ; TH_A6
      7E 00                  516
091C  00 00 00 00 00 00      517                DB      000H,000H,000H,000H,000H,000H           ; BT_A6
0922  00 38 6C 6C 38 00      518                DB      000H,038H,06CH,06CH,038H,000H,07CH,000H ; TH_A7
      7C 00                  519
092A  00 00 00 00 00 00      520                DB      000H,000H,000H,000H,000H,000H           ; BT_A7
0930  00 00 30 30 00 30      521                DB      000H,000H,030H,030H,000H,030H,030H,060H ; TH_A8
      30 60                  522
0938  C6 C6 7C 00 00 00      523                DB      0C6H,0C6H,07CH,000H,000H,000H           ; BT_A8
093E  00 00 00 00 00 00      524                DB      000H,000H,000H,000H,000H,000H,0FEH,0C0H ; TH_A9
      FE C0                  525
0946  C0 C0 00 00 00 00      526                DB      0C0H,0C0H,000H,000H,000H,000H           ; BT_A9
094C  00 00 00 00 00 00      527                DB      000H,000H,000H,000H,000H,000H,0FEH,006H ; TH_AA
      FE 06                  528
0954  06 06 00 00 00 00      529                DB      006H,006H,000H,000H,000H,000H           ; BT_AA
095A  00 C0 C0 C6 CC D8      530                DB      000H,0C0H,0C0H,0C6H,0CCH,0D8H,030H,060H ; TH_AB
      30 60                  531
0962  DC 86 0C 18 3E 00      532                DB      0DCH,086H,00CH,018H,03EH,000H           ; BT_AB
0968  00 C0 C0 C6 CC D8      533                DB      000H,0C0H,0C0H,0C6H,0CCH,0D8H,030H,066H ; TH_AC
      30 66                  534
0970  CE 9E 3E 06 06 00      535                DB      0CEH,09EH,03EH,006H,006H,000H           ; BT_AC
0976  00 00 18 18 00 18      536                DB      000H,000H,018H,018H,000H,018H,018H,03CH ; TH_AD
      18 3C                  537
097E  3C 3C 18 00 00 00      538                DB      03CH,03CH,018H,000H,000H,000H           ; BT_AD
0984  00 00 00 00 36 6C      539                DB      000H,000H,000H,000H,036H,06CH,0D8H,06CH ; TH_AE
      D8 6C                  540
098C  36 00 00 00 00 00      541                DB      036H,000H,000H,000H,000H,000H           ; BT_AE
0992  00 00 00 00 D8 6C      542                DB      000H,000H,000H,000H,0D8H,06CH,036H,06CH ; TH_AF
      36 6C                  543
099A  D8 00 00 00 00 00      544                DB      0D8H,000H,000H,000H,000H,000H           ; BT_AF
                             545
09A0  11 44 11 44 11 44      546                DB      011H,044H,011H,044H,011H,044H,011H,044H ; TH_B0
      11 44                  547
09A8  11 44 11 44 11 44      548                DB      011H,044H,011H,044H,011H,044H           ; BT_B0
09AE  55 AA 55 AA 55 AA      549                DB      055H,0AAH,055H,0AAH,055H,0AAH,055H,0AAH ; TH_B1
      55 AA                  550
09B6  55 AA 55 AA 55 AA      551                DB      055H,0AAH,055H,0AAH,055H,0AAH           ; BT_B1
09BC  DD 77 DD 77 DD 77      552                DB      0DDH,077H,0DDH,077H,0DDH,077H,0DDH,077H ; TH_B2
      DD 77                  553
09C4  DD 77 DD 77 DD 77      554                DB      0DDH,077H,0DDH,077H,0DDH,077H           ; BT_B2
09CA  18 18 18 18 18 18      555                DB      018H,018H,018H,018H,018H,018H,018H,018H ; TH_83
      18 18                  556
09D2  18 18 18 18 18 18      557                DB      018H,018H,018H,018H,018H,018H           ; BT_B3
09D8  18 18 18 18 18 18      558                DB      018H,018H,018H,018H,018H,018H,018H,0F8H ; TH_B4
      18 F8                  559
09E0  18 18 18 18 18 18      560                DB      018H,018H,018H,018H,018H,018H           ; BT_B4
09E6  18 18 18 18 18 F8      561                DB      018H,018H,018H,018H,018H,0F8H,018H,0F8H ; TH_B5
      18 F8                  562
09EE  18 18 18 18 18 18      563                DB      018H,018H,018H,018H,018H,018H           ; BT_B5
09F4  36 36 36 36 36 36      564                DB      036H,036H,036H,036H,036H,036H,036H,0F6H ; TH_B6
      36 F6                  565
09FC  36 36 36 36 36 36      566                DB      036H,036H,036H,036H,036H,036H           ; BT_B6
0A02  00 00 00 00 00 00      567                DB      000H,000H,000H,000H,000H,000H,000H,0FEH ; TH_B7
      00 FE                  568
0A0A  36 36 36 36 36 36      569                DB      036H,036H,036H,036H,036H,036H           ; BT_B7
```

```
0A10  00 00 00 00 00 F8      570                DB      000H,000H,000H,000H,000H,0F8H,018H,0F8H ; TH_B8
      18 F8                  571
0A18  18 18 18 18 18 18      572                DB      018H,018H,018H,018H,018H,018H           ; BT_B8
0A1E  36 36 36 36 36 F6      573                DB      036H,036H,036H,036H,036H,0F6H,006H,0F6H ; TH_B9
      06 F6                  574
0A26  36 36 36 36 36 36      575                DB      036H,036H,036H,036H,036H,036H           ; BT_B9
0A2C  36 36 36 36 36 36      576                DB      036H,036H,036H,036H,036H,036H,036H,036H ; TH_BA
      36 36                  577
0A34  36 36 36 36 36 36      578                DB      036H,036H,036H,036H,036H,036H           ; BT_BA
0A3A  00 00 00 00 00 FE      579                DB      000H,000H,000H,000H,000H,0FEH,006H,0F6H ; TH_BB
      06 F6                  580
0A42  36 36 36 36 36 36      581                DB      036H,036H,036H,036H,036H,036H           ; BT_BB
0A48  36 36 36 36 36 F6      582                DB      036H,036H,036H,036H,036H,0F6H,006H,0FEH ; TH_BC
      06 FE                  583
0A50  00 00 00 00 00 00      584                DB      000H,000H,000H,000H,000H,000H           ; BT_BC
0A56  36 36 36 36 36 36      585                DB      036H,036H,036H,036H,036H,036H,036H,0FEH ; TH_BD
      36 FE                  586
0A5E  00 00 00 00 00 00      587                DB      000H,000H,000H,000H,000H,000H           ; BT_BD
0A64  18 18 18 18 18 F8      588                DB      018H,018H,018H,018H,018H,0F8H,018H,0F8H ; TH_BE
      18 F8                  589
0A6C  00 00 00 00 00 00      590                DB      000H,000H,000H,000H,000H,000H           ; BT_BE
0A72  00 00 00 00 00 00      591                DB      000H,000H,000H,000H,000H,000H,000H,0F8H ; TH_BF
      00 F8                  592
0A7A  18 18 18 18 18 18      593                DB      018H,018H,018H,018H,018H,018H           ; BT_BF
                             594
0A80  18 18 18 18 18 18      595                DB      018H,018H,018H,018H,018H,018H,018H,01FH ; TH_C0
      18 1F                  596
0A88  00 00 00 00 00 00      597                DB      000H,000H,000H,000H,000H,000H           ; BT_C0
0A8E  18 18 18 18 18 18      598                DB      018H,018H,018H,018H,018H,018H,018H,0FFH ; TH_C1
      18 FF                  599
0A96  00 00 00 00 00 00      600                DB      000H,000H,000H,000H,000H,000H           ; BT_C1
0A9C  00 00 00 00 00 00      601                DB      000H,000H,000H,000H,000H,000H,000H,0FFH ; TH_C2
      00 FF                  602
0AA4  18 18 18 18 18 18      603                DB      018H,018H,018H,018H,018H,018H           ; BT_C2
0AAA  18 18 18 18 18 18      604                DB      018H,018H,018H,018H,018H,018H,018H,01FH ; TH_C3
      18 1F                  605
0AB2  18 18 18 18 18 18      606                DB      018H,018H,018H,018H,018H,018H           ; BT_C3
0AB8  00 00 00 00 00 00      607                DB      000H,000H,000H,000H,000H,000H,000H,0FFH ; TH_C4
      00 FF                  608
0AC0  00 00 00 00 00 00      609                DB      000H,000H,000H,000H,000H,000H           ; BT_C4
0AC6  18 18 18 18 18 18      610                DB      018H,018H,018H,018H,018H,018H,018H,0FFH ; TH_C5
      18 FF                  611
0ACE  18 18 18 18 18 18      612                DB      018H,018H,018H,018H,018H,018H           ; BT_C5
0AD4  18 18 18 18 18 1F      613                DB      018H,018H,018H,018H,018H,01FH,018H,01FH ; TH_C6
      18 1F                  614
0ADC  18 18 18 18 18 18      615                DB      018H,018H,018H,018H,018H,018H           ; BT_C6
0AE2  36 36 36 36 36 36      616                DB      036H,036H,036H,036H,036H,036H,036H,037H ; TH_C7
      36 37                  617
0AEA  36 36 36 36 36 36      618                DB      036H,036H,036H,036H,036H,036H           ; BT_C7
0AF0  36 36 36 36 36 37      619                DB      036H,036H,036H,036H,036H,037H,030H,03FH ; TH_C8
      30 3F                  620
0AF8  00 00 00 00 00 00      621                DB      000H,000H,000H,000H,000H,000H           ; BT_C8
0AFE  00 00 00 00 00 3F      622                DB      000H,000H,000H,000H,000H,03FH,030H,037H ; TH_C9
      30 37                  623
0B06  36 36 36 36 36 36      624                DB      036H,036H,036H,036H,036H,036H           ; BT_C9
0B0C  36 36 36 36 36 F7      625                DB      036H,036H,036H,036H,036H,0F7H,000H,0FFH ; TH_CA
      00 FF                  626
0B14  00 00 00 00 00 00      627                DB      000H,000H,000H,000H,000H,000H           ; BT_CA
0B1A  00 00 00 00 00 FF      628                DB      000H,000H,000H,000H,000H,0FFH,000H,0F7H ; TH_CB
      00 F7                  629
0B22  36 36 36 36 36 36      630                DB      036H,036H,036H,036H,036H,036H           ; BT_CB
0B28  36 36 36 36 36 37      631                DB      036H,036H,036H,036H,036H,037H,030H,037H ; TH_CC
      30 37                  632
0B30  36 36 36 36 36 36      633                DB      036H,036H,036H,036H,036H,036H           ; BT_CC
0B36  00 00 00 00 00 FF      634                DB      000H,000H,000H,000H,000H,0FFH,000H,0FFH ; TH_CD
      00 FF                  635
0B3E  00 00 00 00 00 00      636                DB      000H,000H,000H,000H,000H,000H           ; BT_CD
0B44  36 36 36 36 36 F7      637                DB      036H,036H,036H,036H,036H,0F7H,000H,0F7H ; TH_CE
      00 F7                  638
0B4C  36 36 36 36 36 36      639                DB      036H,036H,036H,036H,036H,036H           ; BT_CE
0B52  18 18 18 18 18 FF      640                DB      018H,018H,018H,018H,018H,0FFH,000H,0FFH ; TH_CF
      00 FF                  641
0B5A  00 00 00 00 00 00      642                DB      000H,000H,000H,000H,000H,000H           ; BT_CF
                             643
0B60  36 36 36 36 36 36      644                DB      036H,036H,036H,036H,036H,036H,036H,0FFH ; TH_D0
      36 FF                  645
0B68  00 00 00 00 00 00      646                DB      000H,000H,000H,000H,000H,000H           ; BT_D0
0B6E  00 00 00 00 00 FF      647                DB      000H,000H,000H,000H,000H,0FFH,000H,0FFH ; TH_D1
      00 FF                  648
0B76  18 18 18 18 18 18      649                DB      018H,018H,018H,018H,018H,018H           ; BT_D1
0B7C  00 00 00 00 00 00      650                DB      000H,000H,000H,000H,000H,000H,000H,0FFH ; TH_D2
      00 FF                  651
0B84  36 36 36 36 36 36      652                DB      036H,036H,036H,036H,036H,036H           ; BT_D2
0B8A  36 36 36 36 36 36      653                DB      036H,036H,036H,036H,036H,036H,036H,03FH ; TH_D3
      36 3F                  654
0B92  00 00 00 00 00 00      655                DB      000H,000H,000H,000H,000H,000H           ; BT_D3
0B98  18 18 18 18 18 1F      656                DB      018H,018H,018H,018H,018H,01FH,018H,01FH ; TH_D4
      18 1F                  657
0BA0  00 00 00 00 00 00      658                DB      000H,000H,000H,000H,000H,000H           ; BT_D4
0BA6  00 00 00 00 00 1F      659                DB      000H,000H,000H,000H,000H,01FH,018H,01FH ; TH_D5
      18 1F                  660
0BAE  18 18 18 18 18 18      661                DB      018H,018H,018H,018H,018H,018H           ; BT_D5
0BB4  00 00 00 00 00 00      662                DB      000H,000H,000H,000H,000H,000H,000H,03FH ; TH_D6
      00 3F                  663
0BBC  36 36 36 36 36 36      664                DB      036H,036H,036H,036H,036H,036H           ; BT_D6
0BC2  36 36 36 36 36 36      665                DB      036H,036H,036H,036H,036H,036H,036H,0FFH ; TH_D7
      36 FF                  666
0BCA  36 36 36 36 36 36      667                DB      036H,036H,036H,036H,036H,036H           ; BT_D7
0BD0  18 18 18 18 18 FF      668                DB      018H,018H,018H,018H,018H,0FFH,018H,0FFH ; TH_D8
      18 FF                  669
0BD8  18 18 18 18 18 18      670                DB      018H,018H,018H,018H,018H,018H           ; BT_D8
0BDE  18 18 18 18 18 18      671                DB      018H,018H,018H,018H,018H,018H,018H,0F8H ; TH_D9
      18 F8                  672
0BE6  00 00 00 00 00 00      673                DB      000H,000H,000H,000H,000H,000H           ; BT_D9
0BEC  00 00 00 00 00 00      674                DB      000H,000H,000H,000H,000H,000H,000H,01FH ; TH_DA
      00 1F                  675
0BF4  18 18 18 18 18 18      676                DB      018H,018H,018H,018H,018H,018H           ; BT_DA
0BFA  FF FF FF FF FF FF      677                DB      0FFH,0FFH,0FFH,0FFH,0FFH,0FFH,0FFH,0FFH ; TH_DB
      FF FF                  678
0C02  FF FF FF FF FF FF      679                DB      0FFH,0FFH,0FFH,0FFH,0FFH,0FFH           ; BT_DB
0C08  00 00 00 00 00 00      680                DB      000H,000H,000H,000H,000H,000H,000H,0FFH ; TH_DC
      00 FF                  681
0C10  FF FF FF FF FF FF      682                DB      0FFH,0FFH,0FFH,0FFH,0FFH,0FFH           ; BT_DC
0C16  F0 F0 F0 F0 F0 F0      683                DB      0F0H,0F0H,0F0H,0F0H,0F0H,0F0H,0F0H,0F0H ; TH_DD
      F0 F0                  684
0C1E  F0 F0 F0 F0 F0 F0      685                DB      0F0H,0F0H,0F0H,0F0H,0F0H,0F0H           ; BT_DD
0C24  0F 0F 0F 0F 0F 0F      686                DB      00FH,00FH,00FH,00FH,00FH,00FH,00FH,00FH ; TH_DE
      0F 0F                  687
0C2C  0F 0F 0F 0F 0F 0F      688                DB      00FH,00FH,00FH,00FH,00FH,00FH           ; BT_DE
0C32  FF FF FF FF FF FF      689                DB      0FFH,0FFH,0FFH,0FFH,0FFH,0FFH,0FFH,000H ; TH_DF
      FF 00                  690
0C3A  00 00 00 00 00 00      691                DB      000H,000H,000H,000H,000H,000H           ; BT_DF
                             692
0C40  00 00 00 00 00 76      693                DB      000H,000H,000H,000H,000H,076H,0DCH,0D8H ; TH_E0
      DC D8                  694
0C48  D8 DC 76 00 00 00      695                DB      0D8H,0DCH,076H,000H,000H,000H           ; BT_E0
```

```
0C4E  00 00 00 00 7C C6      696                DB      000H,000H,000H,000H,07CH,0C6H,0FCH,0C6H ; TH_E1
      FC C6                  697
0C56  C6 FC C0 C0 40 00      698                DB      0C6H,0FCH,0C0H,0C0H,040H,000H           ; BT_E1
0C5C  00 00 FE C6 C6 C0      699                DB      000H,000H,0FEH,0C6H,0C6H,0C0H,0C0H,0C0H ; TH_E2
      C0 C0                  700
0C64  C0 C0 C0 00 00 00      701                DB      0C0H,0C0H,0C0H,000H,000H,000H           ; BT_E2
0C6A  00 00 00 00 FE 6C      702                DB      000H,000H,000H,000H,0FEH,06CH,06CH,06CH ; TH_E3
      6C 6C                  703
0C72  6C 6C 6C 00 00 00      704                DB      06CH,06CH,06CH,000H,000H,000H           ; BT_E3
0C78  00 00 FE C6 60 30      705                DB      000H,000H,0FEH,0C6H,060H,030H,018H,030H ; TH_E4
      18 30                  706
0C80  60 C6 FE 00 00 00      707                DB      060H,0C6H,0FEH,000H,000H,000H           ; BT_E4
0C86  00 00 00 00 00 7E      708                DB      000H,000H,000H,000H,000H,07EH,0D8H,0D8H ; TH_E5
      D8 D8                  709
0C8E  D8 D8 70 00 00 00      710                DB      0D8H,0D8H,070H,000H,000H,000H           ; BT_E5
0C94  00 00 00 00 66 66      711                DB      000H,000H,000H,000H,066H,066H,066H,066H ; TH_E6
      66 66                  712
0C9C  7C 60 60 C0 00 00      713                DB      07CH,060H,060H,0C0H,000H,000H           ; BT_E6
0CA2  00 00 00 00 76 DC      714                DB      000H,000H,000H,000H,076H,0DCH,018H,018H ; TH_E7
      18 18                  715
0CAA  18 18 18 00 00 00      716                DB      018H,018H,018H,000H,000H,000H           ; BT_E7
0CB0  00 00 7E 18 3C 66      717                DB      000H,000H,07EH,018H,03CH,066H,066H,066H ; TH_E8
      66 66                  718
0CB8  3C 18 7E 00 00 00      719                DB      03CH,018H,07EH,000H,000H,000H           ; BT_E8
0CBE  00 00 38 6C C6 C6      720                DB      000H,000H,038H,06CH,0C6H,0C6H,0FEH,0C6H ; TH_E9
      FE C6                  721
0CC6  C6 6C 38 00 00 00      722                DB      0C6H,06CH,038H,000H,000H,000H           ; BT_E9
0CCC  00 00 38 6C C6 C6      723                DB      000H,000H,038H,06CH,0C6H,0C6H,0C6H,06CH ; TH_EA
      C6 6C                  724
0CD4  6C 6C EE 00 00 00      725                DB      06CH,06CH,0EEH,000H,000H,000H           ; BT_EA
0CDA  00 00 1E 30 18 0C      726                DB      000H,000H,01EH,030H,018H,00CH,03EH,066H ; TH_EB
      3E 66                  727
0CE2  66 66 3C 00 00 00      728                DB      066H,066H,03CH,000H,000H,000H           ; BT_EB
0CE8  00 00 00 00 00 7E      729                DB      000H,000H,000H,000H,000H,07EH,0DBH,0DBH ; TH_EC
      DB DB                  730
0CF0  7E 00 00 00 00 00      731                DB      07EH,000H,000H,000H,000H,000H           ; BT_EC
0CF6  00 00 03 06 7E DB      732                DB      000H,000H,003H,006H,07EH,0DBH,0DBH,0F3H ; TH_ED
      DB F3                  733
0CFE  7E 60 C0 00 00 00      734                DB      07EH,060H,0C0H,000H,000H,000H           ; BT_ED
0D04  00 00 1C 30 60 60      735                DB      000H,000H,01CH,030H,060H,060H,07CH,060H ; TH_EE
      7C 60                  736
0D0C  60 30 1C 00 00 00      737                DB      060H,030H,01CH,000H,000H,000H           ; BT_EE
0D12  00 00 00 7C C6 C6      738                DB      000H,000H,000H,07CH,0C6H,0C6H,0C6H,0C6H ; TH_EF
      C6 C6                  739
0D1A  C6 C6 C6 00 00 00      740                DB      0C6H,0C6H,0C6H,000H,000H,000H           ; BT_EF
                             741
0D20  00 00 00 FE 00 00      742                DB      000H,000H,000H,0FEH,000H,000H,0FEH,000H ; TH_F0
      FE 00                  743
0D28  00 FE 00 00 00 00      744                DB      000H,0FEH,000H,000H,000H,000H           ; BT_F0
0D2E  00 00 00 18 18 7E      745                DB      000H,000H,000H,018H,018H,07EH,018H,018H ; TH_F1
      18 18                  746
0D36  00 00 FF 00 00 00      747                DB      000H,000H,0FFH,000H,000H,000H           ; BT_F1
0D3C  00 00 30 18 0C 06      748                DB      000H,000H,030H,018H,00CH,006H,00CH,018H ; TH_F2
      0C 18                  749
0D44  30 00 7E 00 00 00      750                DB      030H,000H,07EH,000H,000H,000H           ; BT_F2
0D4A  00 00 0C 18 30 60      751                DB      000H,000H,00CH,018H,030H,060H,030H,018H ; TH_F3
      30 18                  752
0D52  0C 00 7E 00 00 00      753                DB      00CH,000H,07EH,000H,000H,000H           ; BT_F3
0D58  00 00 0E 1B 1B 18      754                DB      000H,000H,00EH,01BH,01BH,018H,018H,018H ; TH_F4
      18 18                  755
0D60  18 18 18 18 18 18      756                DB      018H,018H,018H,018H,018H,018H           ; BT_F4
0D66  18 18 18 18 18 18      757                DB      018H,018H,018H,018H,018H,018H,018H,018H ; TH_F5
      18 18                  758
0D6E  D8 D8 70 00 00 00      759                DB      0D8H,0D8H,070H,000H,000H,000H           ; BT_F5
0D74  00 00 00 18 18 00      760                DB      000H,000H,000H,018H,018H,000H,07EH,000H ; TH_F6
      7E 00                  761
0D7C  18 18 00 00 00 00      762                DB      018H,018H,000H,000H,000H,000H           ; BT_F6
0D82  00 00 00 00 76 DC      763                DB      000H,000H,000H,000H,076H,0DCH,000H,076H ; TH_F7
      00 76                  764
0D8A  DC 00 00 00 00 00      765                DB      0DCH,000H,000H,000H,000H,000H           ; BT_F7
0D90  00 38 6C 6C 38 00      766                DB      000H,038H,06CH,06CH,038H,000H,000H,000H ; TH_F8
      00 00                  767
0D98  00 00 00 00 00 00      768                DB      000H,000H,000H,000H,000H,000H           ; BT_F8
0D9E  00 00 00 00 00 00      769                DB      000H,000H,000H,000H,000H,000H,018H,018H ; TH_F9
      18 18                  770
0DA6  00 00 00 00 00 00      771                DB      000H,000H,000H,000H,000H,000H           ; BT_F9
0DAC  00 00 00 00 00 00      772                DB      000H,000H,000H,000H,000H,000H,000H,018H ; TH_FA
      00 18                  773
0DB4  00 00 00 00 00 00      774                DB      000H,000H,000H,000H,000H,000H           ; BT_FA
0DBA  00 0F 0C 0C 0C 0C      775                DB      000H,00FH,00CH,00CH,00CH,00CH,00CH,0ECH ; TH_FB
      0C EC                  776
0DC2  6C 3C 1C 00 00 00      777                DB      06CH,03CH,01CH,000H,000H,000H           ; BT_FB
0DC8  00 D8 6C 6C 6C 6C      778                DB      000H,0D8H,06CH,06CH,06CH,06CH,06CH,000H ; TH_FC
      6C 00                  779
0DD0  00 00 00 00 00 00      780                DB      000H,000H,000H,000H,000H,000H           ; BT_FC
0DD6  00 70 D8 30 60 C8      781                DB      000H,070H,0D8H,030H,060H,0C8H,0F8H,000H ; TH_FD
      F8 00                  782
0DDE  00 00 00 00 00 00      783                DB      000H,000H,000H,000H,000H,000H           ; BT_FD
0DE4  00 00 00 00 7C 7C      784                DB      000H,000H,000H,000H,07CH,07CH,07CH,07CH ; TH_FE
      7C 7C                  785
0DEC  7C 7C 00 00 00 00      786                DB      07CH,07CH,000H,000H,000H,000H           ; BT_FE
0DF2  00 00 00 00 00 00      787                DB      000H,000H,000H,000H,000H,000H,000H,000H ; TH_FF
      00 00                  788
0DFA  00 00 00 00 00 00      789                DB      000H,000H,000H,000H,000H,000H           ; BT_FF
0E00                         790        CODE    ENDS
                             791                END


                               1                PAGE,120
                               2                SUBTTL  MONOCHROME CHARACTER GENERATOR  -  ALPHA SUPPLEMENT
0000                           3        CODE    SEGMENT PUBLIC
                               4                PUBLIC  CGMN_FDG
0000                           5        CGMN_FDG        LABEL   BYTE
                               6
                               7        ; STRUCTURE OF THIS FILE
                               8        ;       DB      XXH     WHERE XX IS THE HEX CODE FOR THE FOLLOWING CHAR
                               9        ;       DB      [BYTES 0 - 13 OF THAT CHARACTER]
                              10        ;       ...
                              11        ;       DB      00H     INDICATES NO MORE REPLACEMENTS TO BE DONE
                              12
                              13
0000  1D                     14                DB      01DH                                    ;
0001  00 00 00 00 24 66      15                DB      000H,000H,000H,000H,024H,066H,0FFH,066H ; TH_1D
      FF 66                  16
0009  24 00 00 00 00 00      17                DB      024H,000H,000H,000H,000H,000H           ; BT_1D
000F  22                     18                DB      022H                                    ;
0010  00 63 63 63 22 00      19                DB      000H,063H,063H,063H,022H,000H,000H,000H ; TH_22 "
      00 00                  20
0018  00 00 00 00 00 00      21                DB      000H,000H,000H,000H,000H,000H           ; BT_22 "
001E  2B                     22                DB      02BH                                    ;
001F  00 00 00 18 18 18      23                DB      000H,000H,000H,018H,018H,018H,0FFH,018H ; TH_2B +
      FF 18                  24
0027  18 18 00 00 00 00      25                DB      018H,018H,000H,000H,000H,000H           ; BT_2B +
002D  2D                     26                DB      02DH                                    ;
002E  00 00 00 00 00 00      27                DB      000H,000H,000H,000H,000H,000H,0FFH,000H ; TH_2D -
      FF 00                  28
```

```
0036  00 00 00 00 00 00                29                      DB      000H,000H,000H,000H,000H,000H           ; BT_2D -
003C  4D                                30                      DB      04DH                                    ;
003D  00 00 C3 E7 FF DB                 31                      DB      000H,000H,0C3H,0E7H,0FFH,0DBH,0C3H,0C3H ; TH_4D M
      C3 C3                             32
0045  C3 C3 C3 00 00 00                33                      DB      0C3H,0C3H,0C3H,000H,000H,000H           ; BT_4D M
004B  54                                34                      DB      054H                                    ;
004C  00 00 FF DB 99 18                 35                      DB      000H,000H,0FFH,0DBH,099H,018H,018H,018H ; TH_54 T
      18 18                             36
0054  18 18 3C 00 00 00                37                      DB      018H,018H,03CH,000H,000H,000H           ; BT_54 T
005A  56                                38                      DB      056H                                    ;
005B  00 00 C3 C3 C3 C3                 39                      DB      000H,000H,0C3H,0C3H,0C3H,0C3H,0C3H,0C3H ; TH_56 V
      C3 C3                             40
0063  66 3C 18 00 00 00                41                      DB      066H,03CH,018H,000H,000H,000H           ; BT_56 V
0069  57                                42                      DB      057H                                    ;
006A  00 00 C3 C3 C3 C3                 43                      DB      000H,000H,0C3H,0C3H,0C3H,0C3H,0DBH,0DBH ; TH_57 W
      DB DB                             44
0072  FF 66 66 00 00 00                45                      DB      0FFH,066H,066H,000H,000H,000H           ; BT_57 W
0078  58                                46                      DB      058H                                    ;
0079  00 00 C3 C3 66 3C                 47                      DB      000H,000H,0C3H,0C3H,066H,03CH,018H,03CH ; TH_58 X
      18 3C                             48
0081  66 C3 C3 00 00 00                49                      DB      066H,0C3H,0C3H,000H,000H,000H           ; BT_58 X
0087  59                                50                      DB      059H                                    ;
0088  00 00 C3 C3 C3 66                 51                      DB      000H,000H,0C3H,0C3H,0C3H,066H,03CH,018H ; TH_59 Y
      3C 18                             52
0090  18 18 3C 00 00 00                53                      DB      018H,018H,03CH,000H,000H,000H           ; BT_59 Y
0096  5A                                54                      DB      05AH                                    ;
0097  00 00 FF C3 86 0C                 55                      DB      000H,000H,0FFH,0C3H,086H,00CH,018H,030H ; TH_5A Z
      18 30                             56
009F  61 C3 FF 00 00 00                57                      DB      061H,0C3H,0FFH,000H,000H,000H           ; BT_5A Z
00A5  6D                                58                      DB      06DH                                    ;
00A6  00 00 00 00 00 E6                 59                      DB      000H,000H,000H,000H,000H,0E6H,0FFH,0DBH ; TH_6D L.C. M
      FF DB                             60
00AE  DB DB DB 00 00 00                61                      DB      0DBH,0DBH,0DBH,000H,000H,000H           ; BT_6D L.C. M
00B4  76                                62                      DB      076H                                    ;
00B5  00 00 00 00 00 C3                 63                      DB      000H,000H,000H,000H,000H,0C3H,0C3H,0C3H ; TH_76 L.C. V
      C3 C3                             64
00BD  66 3C 18 00 00 00                65                      DB      066H,03CH,018H,000H,000H,000H           ; BT_76 L.C. V
00C3  77                                66                      DB      077H                                    ;
00C4  00 00 00 00 00 C3                 67                      DB      000H,000H,000H,000H,000H,0C3H,0C3H,0DBH ; TH_77 L.C. W
      C3 DB                             68
00CC  DB FF 66 00 00 00                69                      DB      0DBH,0FFH,066H,000H,000H,000H           ; BT_77 L.C. W
00D2  91                                70                      DB      091H                                    ;
00D3  00 00 00 00 6E 3B                 71                      DB      000H,000H,000H,000H,06EH,03BH,01BH,07EH ; TH_91
      1B 7E                             72
00DB  D8 DC 77 00 00 00                73                      DB      0D8H,0DCH,077H,000H,000H,000H           ; BT_91
00E1  9B                                74                      DB      09BH                                    ;
00E2  00 18 18 7E C3 C0                 75                      DB      000H,018H,018H,07EH,0C3H,0C0H,0C0H,0C3H ; TH_9B
      C0 C3                             76
00EA  7E 18 18 00 00 00                77                      DB      07EH,018H,018H,000H,000H,000H           ; BT_9B
00F0  9D                                78                      DB      09DH                                    ;
00F1  00 00 C3 66 3C 18                 79                      DB      000H,000H,0C3H,066H,03CH,018H,0FFH,018H ; TH_9D
      FF 18                             80
00F9  FF 18 18 00 00 00                81                      DB      0FFH,018H,018H,000H,000H,000H           ; BT_9D
00FF  9E                                82                      DB      09EH                                    ;
0100  00 FC 66 66 7C 62                 83                      DB      000H,0FCH,066H,066H,07CH,062H,066H,06FH ; TH_9E
      66 6F                             84
0108  66 66 F3 00 00 00                85                      DB      066H,066H,0F3H,000H,000H,000H           ; BT_9E
010E  F1                                86                      DB      0F1H                                    ;
010F  00 00 18 18 18 FF                 87                      DB      000H,000H,018H,018H,018H,0FFH,018H,018H ; TH_F1
      18 18                             88
0117  18 00 FF 00 00 00                89                      DB      018H,000H,0FFH,000H,000H,000H           ; BT_F1
011D  F6                                90                      DB      0F6H                                    ;
011E  00 00 18 18 00 00                 91                      DB      000H,000H,018H,018H,000H,000H,0FFH,000H ; TH_F6
      FF 00                             92
0126  00 18 18 00 00 00                93                      DB      000H,018H,018H,000H,000H,000H           ; BT_F6
012C  00                                94                      DB      000H                                    ; NO MORE
012D                                    95              CODE    ENDS
                                        96                      END


                                        1                       PAGE,120
                                        2                       SUBTTL  DOUBLE DOT CHARACTER GENERATOR
0000                                    3               CODE    SEGMENT PUBLIC
                                        4                       PUBLIC  CGDDOT,INT_1F_1
0000                                    5               CGDDOT  LABEL BYTE
                                        6                                                                       ; DOUBLE DOT
0000  00 00 00 00 00 00                 7                       DB      000H,000H,000H,000H,000H,000H,000H,000H ; D_00
      00 00                             8
0008  7E 81 A5 81 BD 99                 9                       DB      07EH,081H,0A5H,081H,0BDH,099H,081H,07EH ; D_01
      81 7E                             10
0010  7E FF DB FF C3 E7                11                      DB      07EH,0FFH,0DBH,0FFH,0C3H,0E7H,0FFH,07EH ; D_02
      FF 7E                             12
0018  6C FE FE FE 7C 38                13                      DB      06CH,0FEH,0FEH,0FEH,07CH,038H,010H,000H ; D_03
      10 00                             14
0020  10 38 7C FE 7C 38                15                      DB      010H,038H,07CH,0FEH,07CH,038H,010H,000H ; D_04
      10 00                             16
0028  38 7C 38 FE FE 7C                17                      DB      038H,07CH,038H,0FEH,0FEH,07CH,038H,07CH ; D_05
      38 7C                             18
0030  10 10 38 7C FE 7C                19                      DB      010H,010H,038H,07CH,0FEH,07CH,038H,07CH ; D_06
      38 7C                             20
0038  00 00 18 3C 3C 18                21                      DB      000H,000H,018H,03CH,03CH,018H,000H,000H ; D_07
      00 00                             22
0040  FF FF E7 C3 C3 E7                23                      DB      0FFH,0FFH,0E7H,0C3H,0C3H,0E7H,0FFH,0FFH ; D_08
      FF FF                             24
0048  00 3C 66 42 42 66                25                      DB      000H,03CH,066H,042H,042H,066H,03CH,000H ; D_09
      3C 00                             26
0050  FF C3 99 BD BD 99                27                      DB      0FFH,0C3H,099H,0BDH,0BDH,099H,0C3H,0FFH ; D_0A
      C3 FF                             28
0058  0F 07 0F 7D CC CC                29                      DB      00FH,007H,00FH,07DH,0CCH,0CCH,0CCH,078H ; D_0B
      CC 78                             30
0060  3C 66 66 66 3C 18                31                      DB      03CH,066H,066H,066H,03CH,018H,07EH,018H ; D_0C
      7E 18                             32
0068  3F 33 3F 30 30 70                33                      DB      03FH,033H,03FH,030H,030H,070H,0F0H,0E0H ; D_0D
      F0 E0                             34
0070  7F 63 7F 63 63 67                35                      DB      07FH,063H,07FH,063H,063H,067H,0E6H,0C0H ; D_0E
      E6 C0                             36
0078  99 5A 3C E7 E7 3C                37                      DB      099H,05AH,03CH,0E7H,0E7H,03CH,05AH,099H ; D_0F
      5A 99                             38
                                        39
0080  80 E0 F8 FE F8 E0                40                      DB      080H,0E0H,0F8H,0FEH,0F8H,0E0H,080H,000H ; D_10
      80 00                             41
0088  02 0E 3E FE 3E 0E                42                      DB      002H,00EH,03EH,0FEH,03EH,00EH,002H,000H ; D_11
      02 00                             43
0090  18 3C 7E 18 18 7E                44                      DB      018H,03CH,07EH,018H,018H,07EH,03CH,018H ; D_12
      3C 18                             45
0098  66 66 66 66 66 00                46                      DB      066H,066H,066H,066H,066H,000H,066H,000H ; D_13
      66 00                             47
00A0  7F DB DB 7B 1B 1B                48                      DB      07FH,0DBH,0DBH,07BH,01BH,01BH,01BH,000H ; D_14
      1B 00                             49
00A8  3E 63 38 6C 6C 38                50                      DB      03EH,063H,038H,06CH,06CH,038H,0CCH,078H ; D_15
      CC 78                             51
00B0  00 00 00 00 7E 7E                52                      DB      000H,000H,000H,000H,07EH,07EH,07EH,000H ; D_16
      7E 00                             53
00B8  18 3C 7E 18 7E 3C                54                      DB      018H,03CH,07EH,018H,07EH,03CH,018H,0FFH ; D_17
      18 FF                             55
00C0  18 3C 7E 18 18 18                56                      DB      018H,03CH,07EH,018H,018H,018H,018H,000H ; D_18
```

```
      18 00                                57
00C8  18 18 18 18 7E 3C                    58                DB      018H,018H,018H,018H,07EH,03CH,018H,000H ; D_19
      18 00                                59
00D0  00 18 0C FE 0C 18                    60                DB      000H,018H,00CH,0FEH,00CH,018H,000H,000H ; D_1A
      00 00                                61
00D8  00 30 60 FE 60 30                    62                DB      000H,030H,060H,0FEH,060H,030H,000H,000H ; D_1B
      00 00                                63
00E0  00 00 C0 C0 C0 FE                    64                DB      000H,000H,0C0H,0C0H,0C0H,0FEH,000H,000H ; D_1C
      00 00                                65
00E8  00 24 66 FF 66 24                    66                DB      000H,024H,066H,0FFH,066H,024H,000H,000H ; D_1D
      00 00                                67
00F0  00 18 3C 7E FF FF                    68                DB      000H,018H,03CH,07EH,0FFH,0FFH,000H,000H ; D_1E
      00 00                                69
00F8  00 FF FF 7E 3C 18                    70                DB      000H,0FFH,0FFH,07EH,03CH,018H,000H,000H ; D_1F
      00 00                                71
                                           72
0100  00 00 00 00 00 00                    73                DB      000H,000H,000H,000H,000H,000H,000H,000H ; SP D_20
      00 00                                74
0108  30 78 78 30 30 00                    75                DB      030H,078H,078H,030H,030H,000H,030H,000H ; ! D_21
      30 00                                76
0110  6C 6C 6C 00 00 00                    77                DB      06CH,06CH,06CH,000H,000H,000H,000H,000H ; " D_22
      00 00                                78
0118  6C 6C FE 6C FE 6C                    79                DB      06CH,06CH,0FEH,06CH,0FEH,06CH,06CH,000H ; # D_23
      6C 00                                80
0120  30 7C C0 78 0C F8                    81                DB      030H,07CH,0C0H,078H,00CH,0F8H,030H,000H ; $ D_24
      30 00                                82
0128  00 C6 CC 18 30 66                    83                DB      000H,0C6H,0CCH,018H,030H,066H,0C6H,000H ; PER CENT D_25
      C6 00                                84
0130  38 6C 38 76 DC CC                    85                DB      038H,06CH,038H,076H,0DCH,0CCH,076H,000H ; & D_26
      76 00                                86
0138  60 60 C0 00 00 00                    87                DB      060H,060H,0C0H,000H,000H,000H,000H,000H ; ' D_27
      00 00                                88
0140  18 30 60 60 60 30                    89                DB      018H,030H,060H,060H,060H,030H,018H,000H ; ( D_28
      18 00                                90
0148  60 30 18 18 18 30                    91                DB      060H,030H,018H,018H,018H,030H,060H,000H ; ) D_29
      60 00                                92
0150  00 66 3C FF 3C 66                    93                DB      000H,066H,03CH,0FFH,03CH,066H,000H,000H ; * D_2A
      00 00                                94
0158  00 30 30 FC 30 30                    95                DB      000H,030H,030H,0FCH,030H,030H,000H,000H ; + D_2B
      00 00                                96
0160  00 00 00 00 00 30                    97                DB      000H,000H,000H,000H,000H,030H,030H,060H ; , D_2C
      30 60                                98
0168  00 00 00 FC 00 00                    99                DB      000H,000H,000H,0FCH,000H,000H,000H,000H ; - D_2D
      00 00                               100
0170  00 00 00 00 00 30                   101                DB      000H,000H,000H,000H,000H,030H,030H,000H ; . D_2E
      30 00                               102
0178  06 0C 18 30 60 C0                   103                DB      006H,00CH,018H,030H,060H,0C0H,080H,000H ; / D_2F
      80 00                               104
                                          105
0180  7C C6 CE DE F6 E6                   106                DB      07CH,0C6H,0CEH,0DEH,0F6H,0E6H,07CH,000H ; 0 D_30
      7C 00                               107
0188  30 70 30 30 30 30                   108                DB      030H,070H,030H,030H,030H,030H,0FCH,000H ; 1 D_31
      FC 00                               109
0190  78 CC 0C 38 60 CC                   110                DB      078H,0CCH,00CH,038H,060H,0CCH,0FCH,000H ; 2 D_32
      FC 00                               111
0198  78 CC 0C 38 0C CC                   112                DB      078H,0CCH,00CH,038H,00CH,0CCH,078H,000H ; 3 D_33
      78 00                               113
01A0  1C 3C 6C CC FE 0C                   114                DB      01CH,03CH,06CH,0CCH,0FEH,00CH,01EH,000H ; 4 D_34
      1E 00                               115
01A8  FC C0 F8 0C 0C CC                   116                DB      0FCH,0C0H,0F8H,00CH,00CH,0CCH,078H,000H ; 5 D_35
      78 00                               117
01B0  38 60 C0 F8 CC CC                   118                DB      038H,060H,0C0H,0F8H,0CCH,0CCH,078H,000H ; 6 D_36
      78 00                               119
01B8  FC CC 0C 18 30 30                   120                DB      0FCH,0CCH,00CH,018H,030H,030H,030H,000H ; 7 D_37
      30 00                               121
01C0  78 CC CC 78 CC CC                   122                DB      078H,0CCH,0CCH,078H,0CCH,0CCH,078H,000H ; 8 D_38
      78 00                               123
01C8  78 CC CC 7C 0C 18                   124                DB      078H,0CCH,0CCH,07CH,00CH,018H,070H,000H ; 9 D_39
      70 00                               125
01D0  00 30 30 00 00 30                   126                DB      000H,030H,030H,000H,000H,030H,030H,000H ; : D_3A
      30 00                               127
01D8  00 30 30 00 00 30                   128                DB      000H,030H,030H,000H,000H,030H,030H,060H ; ;_3B
      30 60                               129
01E0  18 30 60 C0 60 30                   130                DB      018H,030H,060H,0C0H,060H,030H,018H,000H ; < D_3C
      18 00                               131
01E8  00 00 FC 00 00 FC                   132                DB      000H,000H,0FCH,000H,000H,0FCH,000H,000H ; = D_3D
      00 00                               133
01F0  60 30 18 0C 18 30                   134                DB      060H,030H,018H,00CH,018H,030H,060H,000H ; > D_3E
      60 00                               135
01F8  78 CC 0C 18 30 00                   136                DB      078H,0CCH,00CH,018H,030H,000H,030H,000H ; ? D_3F
      30 00                               137
                                          138
0200  7C C6 DE DE DE C0                   139                DB      07CH,0C6H,0DEH,0DEH,0DEH,0C0H,078H,000H ; @ D_40
      78 00                               140
0208  30 78 CC CC FC CC                   141                DB      030H,078H,0CCH,0CCH,0FCH,0CCH,0CCH,000H ; A D_41
      CC 00                               142
0210  FC 66 66 7C 66 66                   143                DB      0FCH,066H,066H,07CH,066H,066H,0FCH,000H ; B D_42
      FC 00                               144
0218  3C 66 C0 C0 C0 66                   145                DB      03CH,066H,0C0H,0C0H,0C0H,066H,03CH,000H ; C D_43
      3C 00                               146
0220  F8 6C 66 66 66 6C                   147                DB      0F8H,06CH,066H,066H,066H,06CH,0F8H,000H ; D D_44
      F8 00                               148
0228  FE 62 68 78 68 62                   149                DB      0FEH,062H,068H,078H,068H,062H,0FEH,000H ; E D_45
      FE 00                               150
0230  FE 62 68 78 68 60                   151                DB      0FEH,062H,068H,078H,068H,060H,0F0H,000H ; F D_46
      F0 00                               152
0238  3C 66 C0 C0 CE 66                   153                DB      03CH,066H,0C0H,0C0H,0CEH,066H,03EH,000H ; G D_47
      3E 00                               154
0240  CC CC CC FC CC CC                   155                DB      0CCH,0CCH,0CCH,0FCH,0CCH,0CCH,0CCH,000H ; H D_48
      CC 00                               156
0248  78 30 30 30 30 30                   157                DB      078H,030H,030H,030H,030H,030H,078H,000H ; I D_49
      78 00                               158
0250  1E 0C 0C 0C CC CC                   159                DB      01EH,00CH,00CH,00CH,0CCH,0CCH,078H,000H ; J D_4A
      78 00                               160
0258  E6 66 6C 78 6C 66                   161                DB      0E6H,066H,06CH,078H,06CH,066H,0E6H,000H ; K D_4B
      E6 00                               162
0260  F0 60 60 60 62 66                   163                DB      0F0H,060H,060H,060H,062H,066H,0FEH,000H ; L D_4C
      FE 00                               164
0268  C6 EE FE FE D6 C6                   165                DB      0C6H,0EEH,0FEH,0FEH,0D6H,0C6H,0C6H,000H ; M D_4D
      C6 00                               166
0270  C6 E6 F6 DE CE C6                   167                DB      0C6H,0E6H,0F6H,0DEH,0CEH,0C6H,0C6H,000H ; N D_4E
      C6 00                               168
0278  38 6C C6 C6 C6 6C                   169                DB      038H,06CH,0C6H,0C6H,0C6H,06CH,038H,000H ; O D_4F
      38 00                               170
                                          171
0280  FC 66 66 7C 60 60                   172                DB      0FCH,066H,066H,07CH,060H,060H,0F0H,000H ; P D_50
      F0 00                               173
0288  78 CC CC CC DC 78                   174                DB      078H,0CCH,0CCH,0CCH,0DCH,078H,01CH,000H ; Q D_51
      1C 00                               175
0290  FC 66 66 7C 6C 66                   176                DB      0FCH,066H,066H,07CH,06CH,066H,0E6H,000H ; R D_52
      E6 00                               177
0298  78 CC E0 70 1C CC                   178                DB      078H,0CCH,0E0H,070H,01CH,0CCH,078H,000H ; S D_53
      78 00                               179
02A0  FC B4 30 30 30 30                   180                DB      0FCH,0B4H,030H,030H,030H,030H,078H,000H ; T D_54
      78 00                               181
02A8  CC CC CC CC CC CC                   182                DB      0CCH,0CCH,0CCH,0CCH,0CCH,0CCH,0FCH,000H ; U D_55
```

```
      FC 00                          183
02B0  CC CC CC CC CC 78              184                DB      0CCH,0CCH,0CCH,0CCH,0CCH,078H,030H,000H ; V D_56
      30 00                          185
02B8  C6 C6 C6 D6 FE EE              186                DB      0C6H,0C6H,0C6H,0D6H,0FEH,0EEH,0C6H,000H ; W D_57
      C6 00                          187
02C0  C6 C6 6C 38 38 6C              188                DB      0C6H,0C6H,06CH,038H,038H,06CH,0C6H,000H ; X D_58
      C6 00                          189
02C8  CC CC CC 78 30 30              190                DB      0CCH,0CCH,0CCH,078H,030H,030H,078H,000H ; Y D_59
      78 00                          191
02D0  FE C6 8C 18 32 66              192                DB      0FEH,0C6H,08CH,018H,032H,066H,0FEH,000H ; Z D_5A
      FE 00                          193
02D8  78 60 60 60 60 60              194                DB      078H,060H,060H,060H,060H,060H,078H,000H ; [ D_5B
      78 00                          195
02E0  C0 60 30 18 0C 06              196                DB      0C0H,060H,030H,018H,00CH,006H,002H,000H ; BACKSLASH D_5C
      02 00                          197
02E8  78 18 18 18 18 18              198                DB      078H,018H,018H,018H,018H,018H,078H,000H ; ] D_5D
      78 00                          199
02F0  10 38 6C C6 00 00              200                DB      010H,038H,06CH,0C6H,000H,000H,000H,000H ; CIRCUMFLEX D_5E
      00 00                          201
02F8  00 00 00 00 00 00              202                DB      000H,000H,000H,000H,000H,000H,000H,0FFH ; _ D_5F
      00 FF                          203
                                     204
0300  30 30 18 00 00 00              205                DB      030H,030H,018H,000H,000H,000H,000H,000H ; ` D_60
      00 00                          206
0308  00 00 78 0C 7C CC              207                DB      000H,000H,078H,00CH,07CH,0CCH,076H,000H ; LOWER CASE A D_61
      76 00                          208
0310  E0 60 60 7C 66 66              209                DB      0E0H,060H,060H,07CH,066H,066H,0DCH,000H ; L.C. B D_62
      DC 00                          210
0318  00 00 78 CC C0 CC              211                DB      000H,000H,078H,0CCH,0C0H,0CCH,078H,000H ; L.C. C D_63
      78 00                          212
0320  1C 0C 0C 7C CC CC              213                DB      01CH,00CH,00CH,07CH,0CCH,0CCH,076H,000H ; L.C. D D_64
      76 00                          214
0328  00 00 78 CC FC C0              215                DB      000H,000H,078H,0CCH,0FCH,0C0H,078H,000H ; L.C. E D_65
      78 00                          216
0330  38 6C 60 F0 60 60              217                DB      038H,06CH,060H,0F0H,060H,060H,0F0H,000H ; L.C. F D_66
      F0 00                          218
0338  00 00 76 CC CC 7C              219                DB      000H,000H,076H,0CCH,0CCH,07CH,00CH,0F8H ; L.C. G D_67
      0C F8                          220
0340  E0 60 6C 76 66 66              221                DB      0E0H,060H,06CH,076H,066H,066H,0E6H,000H ; L.C. H D_68
      E6 00                          222
0348  30 00 70 30 30 30              223                DB      030H,000H,070H,030H,030H,030H,078H,000H ; L.C. 1 D_69
      78 00                          224
0350  0C 00 0C 0C 0C CC              225                DB      00CH,000H,00CH,00CH,00CH,0CCH,0CCH,078H ; L.C. J D_6A
      CC 78                          226
0358  E0 60 66 6C 78 6C              227                DB      0E0H,060H,066H,06CH,078H,06CH,0E6H,000H ; L.C. K D_6B
      E6 00                          228
0360  70 30 30 30 30 30              229                DB      070H,030H,030H,030H,030H,030H,078H,000H ; L.C. L D_6C
      78 00                          230
0368  00 00 CC FE FE D6              231                DB      000H,000H,0CCH,0FEH,0FEH,0D6H,0C6H,000H ; L.C. M D_6D
      C6 00                          232
0370  00 00 F8 CC CC CC              233                DB      000H,000H,0F8H,0CCH,0CCH,0CCH,0CCH,000H ; L.C. N D_6E
      CC 00                          234
0378  00 00 78 CC CC CC              235                DB      000H,000H,078H,0CCH,0CCH,0CCH,078H,000H ; L.C. O D_6F
      78 00                          236
                                     237
0380  00 00 DC 66 66 7C              238                DB      000H,000H,0DCH,066H,066H,07CH,060H,0F0H ; L.C. P D_70
      60 F0                          239
0388  00 00 76 CC CC 7C              240                DB      000H,000H,076H,0CCH,0CCH,07CH,00CH,01EH ; L.C. Q D_71
      0C 1E                          241
0390  00 00 DC 76 66 60              242                DB      000H,000H,0DCH,076H,066H,060H,0F0H,000H ; L.C. R D_72
      F0 00                          243
0398  00 00 7C C0 78 0C              244                DB      000H,000H,07CH,0C0H,078H,00CH,0F8H,000H ; L.C. S D_73
      F8 00                          245
03A0  10 30 7C 30 30 34              246                DB      010H,030H,07CH,030H,030H,034H,018H,000H ; L.C. T D_74
      18 00                          247
03A8  00 00 CC CC CC CC              248                DB      000H,000H,0CCH,0CCH,0CCH,0CCH,076H,000H ; L.C. U D_75
      76 00                          249
03B0  00 00 CC CC CC 78              250                DB      000H,000H,0CCH,0CCH,0CCH,078H,030H,000H ; L.C. V D_76
      30 00                          251
03B8  00 00 C6 D6 FE FE              252                DB      000H,000H,0C6H,0D6H,0FEH,0FEH,06CH,000H ; L.C. W D_77
      6C 00                          253
03C0  00 00 C6 6C 38 6C              254                DB      000H,000H,0C6H,06CH,038H,06CH,0C6H,000H ; L.C. X D_78
      C6 00                          255
03C8  00 00 CC CC CC 7C              256                DB      000H,000H,0CCH,0CCH,0CCH,07CH,00CH,0F8H ; L.C. Y D_79
      0C F8                          257
03D0  00 00 FC 98 30 64              258                DB      000H,000H,0FCH,098H,030H,064H,0FCH,000H ; L.C. Z D_7A
      FC 00                          259
03D8  1C 30 30 E0 30 30              260                DB      01CH,030H,030H,0E0H,030H,030H,01CH,000H ; L BRAK D_7B
      1C 00                          261
03E0  18 18 18 00 18 18              262                DB      018H,018H,018H,000H,018H,018H,018H,000H ; | D_7C
      18 00                          263
03E8  E0 30 30 1C 30 30              264                DB      0E0H,030H,030H,01CH,030H,030H,0E0H,000H ; R BRAK D_7D
      E0 00                          265
03F0  76 DC 00 00 00 00              266                DB      076H,0DCH,000H,000H,000H,000H,000H,000H ; TILDE D_7E
      00 00                          267
03F8  00 10 38 6C C6 C6              268                DB      000H,010H,038H,06CH,0C6H,0C6H,0FEH,000H ; DELTA D_7F
      FE 00                          269
                                     270
                                     271
0400                                 272        INT_1F_1        LABEL BYTE
0400  78 CC C0 CC 78 18              273                DB      078H,0CCH,0C0H,0CCH,078H,018H,00CH,078H ; D_80
      0C 78                          274
0408  00 CC 00 CC CC CC              275                DB      000H,0CCH,000H,0CCH,0CCH,0CCH,07EH,000H ; D_81
      7E 00                          276
0410  1C 00 78 CC FC C0              277                DB      01CH,000H,078H,0CCH,0FCH,0C0H,078H,000H ; D_82
      78 00                          278
0418  7E C3 3C 06 3E 66              279                DB      07EH,0C3H,03CH,006H,03EH,066H,03FH,000H ; D_83
      3F 00                          280
0420  CC 00 78 0C 7C CC              281                DB      0CCH,000H,078H,00CH,07CH,0CCH,07EH,000H ; D_84
      7E 00                          282
0428  E0 00 78 0C 7C CC              283                DB      0E0H,000H,078H,00CH,07CH,0CCH,07EH,000H ; D_85
      7E 00                          284
0430  30 30 78 0C 7C CC              285                DB      030H,030H,078H,00CH,07CH,0CCH,07EH,000H ; D_86
      7E 00                          286
0438  00 00 78 C0 C0 78              287                DB      000H,000H,078H,0C0H,0C0H,078H,00CH,038H ; D_87
      0C 38                          288
0440  7E C3 3C 66 7E 60              289                DB      07EH,0C3H,03CH,066H,07EH,060H,03CH,000H ; D_88
      3C 00                          290
0448  CC 00 78 CC FC C0              291                DB      0CCH,000H,078H,0CCH,0FCH,0C0H,078H,000H ; D_89
      78 00                          292
0450  E0 00 78 CC FC C0              293                DB      0E0H,000H,078H,0CCH,0FCH,0C0H,078H,000H ; D_8A
      78 00                          294
0458  CC 00 70 30 30 30              295                DB      0CCH,000H,070H,030H,030H,030H,078H,000H ; D_8B
      78 00                          296
0460  7C C6 38 18 18 18              297                DB      07CH,0C6H,038H,018H,018H,018H,03CH,000H ; D_8C
      3C 00                          298
0468  E0 00 70 30 30 30              299                DB      0E0H,000H,070H,030H,030H,030H,078H,000H ; D_8D
      78 00                          300
0470  C6 38 6C C6 FE C6              301                DB      0C6H,038H,06CH,0C6H,0FEH,0C6H,0C6H,000H ; D_8E
      C6 00                          302
0478  30 30 00 78 CC FC              303                DB      030H,030H,000H,078H,0CCH,0FCH,0CCH,000H ; D_8F
      CC 00                          304
                                     305
0480  1C 00 FC 60 78 60              306                DB      01CH,000H,0FCH,060H,078H,060H,0FCH,000H ; D_90
      FC 00                          307
0488  00 00 7F 0C 7F CC              308                DB      000H,000H,07FH,00CH,07FH,0CCH,07FH,000H ; D_91
```

```
      7F 00                     309
0490  3E 6C CC FE CC CC        310              DB      03EH,06CH,0CCH,0FEH,0CCH,0CCH,0CEH,000H ; D_92
      CE 00                     311
0498  78 CC 00 78 CC CC        312              DB      078H,0CCH,000H,078H,0CCH,0CCH,078H,000H ; D_93
      78 00                     313
04A0  00 CC 00 78 CC CC        314              DB      000H,0CCH,000H,078H,0CCH,0CCH,078H,000H ; D_94
      78 00                     315
04A8  00 E0 00 78 CC CC        316              DB      000H,0E0H,000H,078H,0CCH,0CCH,078H,000H ; D_95
      78 00                     317
04B0  78 CC 00 CC CC CC        318              DB      078H,0CCH,000H,0CCH,0CCH,0CCH,07EH,000H ; D_96
      7E 00                     319
04B8  00 E0 00 CC CC CC        320              DB      000H,0E0H,000H,0CCH,0CCH,0CCH,07EH,000H ; D_97
      7E 00                     321
04C0  00 CC 00 CC CC 7C        322              DB      000H,0CCH,000H,0CCH,0CCH,07CH,00CH,0F8H ; D_98
      0C F8                     323
04C8  C3 18 3C 66 66 3C        324              DB      0C3H,018H,03CH,066H,066H,03CH,018H,000H ; D_99
      18 00                     325
04D0  CC 00 CC CC CC CC        326              DB      0CCH,000H,0CCH,0CCH,0CCH,0CCH,078H,000H ; D_9A
      78 00                     327
04D8  18 18 7E C0 C0 7E        328              DB      018H,018H,07EH,0C0H,0C0H,07EH,018H,018H ; D_9B
      18 18                     329
04E0  38 6C 64 F0 60 E6        330              DB      038H,06CH,064H,0F0H,060H,0E6H,0FCH,000H ; D_9C
      FC 00                     331
04E8  CC CC 78 FC 30 FC        332              DB      0CCH,0CCH,078H,0FCH,030H,0FCH,030H,030H ; D_9D
      30 30                     333
04F0  F8 CC CC FA C6 CF        334              DB      0F8H,0CCH,0CCH,0FAH,0C6H,0CFH,0C6H,0C7H ; D_9E
      C6 C7                     335
04F8  0E 1B 18 3C 18 18        336              DB      00EH,01BH,018H,03CH,018H,018H,0D8H,070H ; D_9F
      D8 70                     337
                                338
0500  1C 00 78 0C 7C CC        339              DB      01CH,000H,078H,00CH,07CH,0CCH,07EH,000H ; D_A0
      7E 00                     340
0508  38 00 70 30 30 30        341              DB      038H,000H,070H,030H,030H,030H,078H,000H ; D_A1
      78 00                     342
0510  00 1C 00 78 CC CC        343              DB      000H,01CH,000H,078H,0CCH,0CCH,078H,000H ; D_A2
      78 00                     344
0518  00 1C 00 CC CC CC        345              DB      000H,01CH,000H,0CCH,0CCH,0CCH,07EH,000H ; D_A3
      7E 00                     346
0520  00 F8 00 F8 CC CC        347              DB      000H,0F8H,000H,0F8H,0CCH,0CCH,0CCH,000H ; D_A4
      CC 00                     348
0528  FC 00 CC EC FC DC        349              DB      0FCH,000H,0CCH,0ECH,0FCH,0DCH,0CCH,000H ; D_A5
      CC 00                     350
0530  3C 6C 6C 3E 00 7E        351              DB      03CH,06CH,06CH,03EH,000H,07EH,000H,000H ; D_A6
      00 00                     352
0538  38 6C 6C 38 00 7C        353              DB      038H,06CH,06CH,038H,000H,07CH,000H,000H ; D_A7
      00 00                     354
0540  30 00 30 60 C0 CC        355              DB      030H,000H,030H,060H,0C0H,0CCH,078H,000H ; D_A8
      78 00                     356
0548  00 00 00 FC C0 C0        357              DB      000H,000H,000H,0FCH,0C0H,0C0H,000H,000H ; D_A8
      00 00                     358
0550  00 00 00 FC 0C 0C        359              DB      000H,000H,000H,0FCH,00CH,00CH,000H,000H ; D_AA
      00 00                     360
0558  C3 C6 CC DE 33 66        361              DB      0C3H,0C6H,0CCH,0DEH,033H,066H,0CCH,00FH ; D_AB
      CC 0F                     362
0560  C3 C6 CC DB 37 6F        363              DB      0C3H,0C6H,0CCH,0DBH,037H,06FH,0CFH,003H ; D_AC
      CF 03                     364
0568  18 18 00 18 18 18        365              DB      018H,018H,000H,018H,018H,018H,018H,000H ; D_AD
      18 00                     366
0570  00 33 66 CC 66 33        367              DB      000H,033H,066H,0CCH,066H,033H,000H,000H ; D_AE
      00 00                     368
0578  00 CC 66 33 66 CC        369              DB      000H,0CCH,066H,033H,066H,0CCH,000H,000H ; D_AF
      00 00                     370
                                371
0580  22 88 22 88 22 88        372              DB      022H,088H,022H,088H,022H,088H,022H,088H ; D_B0
      22 88                     373
0588  55 AA 55 AA 55 AA        374              DB      055H,0AAH,055H,0AAH,055H,0AAH,055H,0AAH ; D_B1
      55 AA                     375
0590  DB 77 DB EE DB 77        376              DB      0DBH,077H,0DBH,0EEH,0DBH,077H,0DBH,0EEH ; D_B2
      DB EE                     377
0598  18 18 18 18 18 18        378              DB      018H,018H,018H,018H,018H,018H,018H,018H ; D_B3
      18 18                     379
05A0  18 18 18 18 F8 18        380              DB      018H,018H,018H,018H,0F8H,018H,018H,018H ; D_B4
      18 18                     381
05A8  18 18 F8 18 F8 18        382              DB      018H,018H,0F8H,018H,0F8H,018H,018H,018H ; D_B5
      18 18                     383
05B0  36 36 36 36 F6 36        384              DB      036H,036H,036H,036H,0F6H,036H,036H,036H ; D_B6
      36 36                     385
05B8  00 00 00 00 FE 36        386              DB      000H,000H,000H,000H,0FEH,036H,036H,036H ; D_B7
      36 36                     387
05C0  00 00 F8 18 F8 18        388              DB      000H,000H,0F8H,018H,0F8H,018H,018H,018H ; D_B8
      18 18                     389
05C8  36 36 F6 06 F6 36        390              DB      036H,036H,0F6H,006H,0F6H,036H,036H,036H ; D_B9
      36 36                     391
05D0  36 36 36 36 36 36        392              DB      036H,036H,036H,036H,036H,036H,036H,036H ; D_BA
      36 36                     393
05D8  00 00 FE 06 F6 36        394              DB      000H,000H,0FEH,006H,0F6H,036H,036H,036H ; D_BB
      36 36                     395
05E0  36 36 F6 06 FE 00        396              DB      036H,036H,0F6H,006H,0FEH,000H,000H,000H ; D_BC
      00 00                     397
05E8  36 36 36 36 FE 00        398              DB      036H,036H,036H,036H,0FEH,000H,000H,000H ; D_BD
      00 00                     399
05F0  18 18 F8 18 F8 00        400              DB      018H,018H,0F8H,018H,0F8H,000H,000H,000H ; D_BE
      00 00                     401
05F8  00 00 00 00 F8 18        402              DB      000H,000H,000H,000H,0F8H,018H,018H,018H ; D_BF
      18 18                     403
                                404
0600  18 18 18 18 1F 00        405              DB      018H,018H,018H,018H,01FH,000H,000H,000H ; D_C0
      00 00                     406
0608  18 18 18 18 FF 00        407              DB      018H,018H,018H,018H,0FFH,000H,000H,000H ; D_C1
      00 00                     408
0610  00 00 00 00 FF 18        409              DB      000H,000H,000H,000H,0FFH,018H,018H,018H ; D_C2
      18 18                     410
0618  18 18 18 18 1F 18        411              DB      018H,018H,018H,018H,01FH,018H,018H,018H ; D_C3
      18 18                     412
0620  00 00 00 00 FF 00        413              DB      000H,000H,000H,000H,0FFH,000H,000H,000H ; D_C4
      00 00                     414
0628  18 18 18 18 FF 18        415              DB      018H,018H,018H,018H,0FFH,018H,018H,018H ; D_C5
      18 18                     416
0630  18 18 1F 18 1F 18        417              DB      018H,018H,01FH,018H,01FH,018H,018H,018H ; D_C6
      18 18                     418
0638  36 36 36 36 37 36        419              DB      036H,036H,036H,036H,037H,036H,036H,036H ; D_C7
      36 36                     420
0640  36 36 37 30 3F 00        421              DB      036H,036H,037H,030H,03FH,000H,000H,000H ; D_C8
      00 00                     422
0648  00 00 3F 30 37 36        423              DB      000H,000H,03FH,030H,037H,036H,036H,036H ; D_C9
      36 36                     424
0650  36 36 F7 00 FF 00        425              DB      036H,036H,0F7H,000H,0FFH,000H,000H,000H ; D_CA
      00 00                     426
0658  00 00 FF 00 F7 36        427              DB      000H,000H,0FFH,000H,0F7H,036H,036H,036H ; D_CB
      36 36                     428
0660  36 36 37 30 37 36        429              DB      036H,036H,037H,030H,037H,036H,036H,036H ; D_CC
      36 36                     430
0668  00 00 FF 00 FF 00        431              DB      000H,000H,0FFH,000H,0FFH,000H,000H,000H ; D_CD
      00 00                     432
0670  36 36 F7 00 F7 36        433              DB      036H,036H,0F7H,000H,0F7H,036H,036H,036H ; D_CE
      36 36                     434
```

```
0678  18 18 FF 00 FF 00      435                     DB      018H,018H,0FFH,000H,0FFH,000H,000H,000H ; D_CF
      00 00                   436
                              437
0680  36 36 36 36 FF 00      438                     DB      036H,036H,036H,036H,0FFH,000H,000H,000H ; D_D0
      00 00                   439
0688  00 00 FF 00 FF 18      440                     DB      000H,000H,0FFH,000H,0FFH,018H,018H,018H ; D_D1
      18 18                   441
0690  00 00 00 00 FF 36      442                     DB      000H,000H,000H,000H,0FFH,036H,036H,036H ; D_D2
      36 36                   443
0698  36 36 36 36 3F 00      444                     DB      036H,036H,036H,036H,03FH,000H,000H,000H ; D_D3
      00 00                   445
06A0  18 18 1F 18 1F 00      446                     DB      018H,018H,01FH,018H,01FH,000H,000H,000H ; D_D4
      00 00                   447
06A8  00 00 1F 18 1F 18      448                     DB      000H,000H,01FH,018H,01FH,018H,018H,018H ; D_D5
      18 18                   449
06B0  00 00 00 00 3F 36      450                     DB      000H,000H,000H,000H,03FH,036H,036H,036H ; D_D6
      36 36                   451
06B8  36 36 36 36 FF 36      452                     DB      036H,036H,036H,036H,0FFH,036H,036H,036H ; D_D7
      36 36                   453
06C0  18 18 FF 18 FF 18      454                     DB      018H,018H,0FFH,018H,0FFH,018H,018H,018H ; D_D8
      18 18                   455
06C8  18 18 18 18 F8 00      456                     DB      018H,018H,018H,018H,0F8H,000H,000H,000H ; D_D9
      00 00                   457
06D0  00 00 00 00 1F 18      458                     DB      000H,000H,000H,000H,01FH,018H,018H,018H ; D_DA
      18 18                   459
06D8  FF FF FF FF FF FF      460                     DB      0FFH,0FFH,0FFH,0FFH,0FFH,0FFH,0FFH,0FFH ; D_DB
      FF FF                   461
06E0  00 00 00 00 FF FF      462                     DB      000H,000H,000H,000H,0FFH,0FFH,0FFH,0FFH ; D_DC
      FF FF                   463
06E8  F0 F0 F0 F0 F0 F0      464                     DB      0F0H,0F0H,0F0H,0F0H,0F0H,0F0H,0F0H,0F0H ; D_DD
      F0 F0                   465
06F0  0F 0F 0F 0F 0F 0F      466                     DB      00FH,00FH,00FH,00FH,00FH,00FH,00FH,00FH ; D_DE
      0F 0F                   467
06F8  FF FF FF FF 00 00      468                     DB      0FFH,0FFH,0FFH,0FFH,000H,000H,000H,000H ; D_DF
      00 00                   469
                              470
0700  00 00 76 DC C8 DC      471                     DB      000H,000H,076H,0DCH,0C8H,0DCH,076H,000H ; D_E0
      76 00                   472
0708  00 78 CC F8 CC F8      473                     DB      000H,078H,0CCH,0F8H,0CCH,0F8H,0C0H,0C0H ; D_E1
      C0 C0                   474
0710  00 FC CC C0 C0 C0      475                     DB      000H,0FCH,0CCH,0C0H,0C0H,0C0H,0C0H,000H ; D_E2
      C0 00                   476
0718  00 FE 6C 6C 6C 6C      477                     DB      000H,0FEH,06CH,06CH,06CH,06CH,06CH,000H ; D_E3
      6C 00                   478
0720  FC CC 60 30 60 CC      479                     DB      0FCH,0CCH,060H,030H,060H,0CCH,0FCH,000H ; D_E4
      FC 00                   480
0728  00 00 7E D8 D8 D8      481                     DB      000H,000H,07EH,0D8H,0D8H,0D8H,070H,000H ; D_E5
      70 00                   482
0730  00 66 66 66 66 7C      483                     DB      000H,066H,066H,066H,066H,07CH,060H,0C0H ; D_E6
      60 C0                   484
0738  00 76 DC 18 18 18      485                     DB      000H,076H,0DCH,018H,018H,018H,018H,000H ; D_E7
      18 00                   486
0740  FC 30 78 CC CC 78      487                     DB      0FCH,030H,078H,0CCH,0CCH,078H,030H,0FCH ; D_E8
      30 FC                   488
0748  38 6C C6 FE C6 6C      489                     DB      038H,06CH,0C6H,0FEH,0C6H,06CH,038H,000H ; D_E9
      38 00                   490
0750  38 6C C6 C6 6C 6C      491                     DB      038H,06CH,0C6H,0C6H,06CH,06CH,0EEH,000H ; D_EA
      EE 00                   492
0758  1C 30 18 7C CC CC      493                     DB      01CH,030H,018H,07CH,0CCH,0CCH,078H,000H ; D_EB
      78 00                   494
0760  00 00 7E DB DB 7E      495                     DB      000H,000H,07EH,0DBH,0DBH,07EH,000H,000H ; D_EC
      00 00                   496
0768  06 0C 7E DB DB 7E      497                     DB      006H,00CH,07EH,0DBH,0DBH,07EH,060H,0C0H ; D_ED
      60 C0                   498
0770  38 60 C0 F8 C0 60      499                     DB      038H,060H,0C0H,0F8H,0C0H,060H,038H,000H ; D_EE
      38 00                   500
0778  78 CC CC CC CC CC      501                     DB      078H,0CCH,0CCH,0CCH,0CCH,0CCH,0CCH,000H ; D_EF
      CC 00                   502
                              503
0780  00 FC 00 FC 00 FC      504                     DB      000H,0FCH,000H,0FCH,000H,0FCH,000H,000H ; D_F0
      00 00                   505
0788  30 30 FC 30 30 00      506                     DB      030H,030H,0FCH,030H,030H,000H,0FCH,000H ; D_F1
      FC 00                   507
0790  60 30 18 30 60 00      508                     DB      060H,030H,018H,030H,060H,000H,0FCH,000H ; D_F2
      FC 00                   509
0798  18 30 60 30 18 00      510                     DB      018H,030H,060H,030H,018H,000H,0FCH,000H ; D_F3
      FC 00                   511
07A0  0E 1B 1B 18 18 18      512                     DB      00EH,01BH,01BH,018H,018H,018H,018H,018H ; D_F4
      18 18                   513
07A8  18 18 18 18 18 D8      514                     DB      018H,018H,018H,018H,018H,0D8H,0D8H,070H ; D_F5
      D8 70                   515
07B0  30 30 00 FC 00 30      516                     DB      030H,030H,000H,0FCH,000H,030H,030H,000H ; D_F6
      30 00                   517
07B8  00 76 DC 00 76 DC      518                     DB      000H,076H,0DCH,000H,076H,0DCH,000H,000H ; D_F7
      00 00                   519
07C0  38 6C 6C 38 00 00      520                     DB      038H,06CH,06CH,038H,000H,000H,000H,000H ; D_F8
      00 00                   521
07C8  00 00 00 18 18 00      522                     DB      000H,000H,000H,018H,018H,000H,000H,000H ; D_F9
      00 00                   523
07D0  00 00 00 00 18 00      524                     DB      000H,000H,000H,000H,018H,000H,000H,000H ; D_FA
      00 00                   525
07D8  0F 0C 0C 0C EC 6C      526                     DB      00FH,00CH,00CH,00CH,0ECH,06CH,03CH,01CH ; D_FB
      3C 1C                   527
07E0  78 6C 6C 6C 6C 00      528                     DB      078H,06CH,06CH,06CH,06CH,000H,000H,000H ; D_FC
      00 00                   529
07E8  70 18 30 60 78 00      530                     DB      070H,018H,030H,060H,078H,000H,000H,000H ; D_FD
      00 00                   531
07F0  00 00 3C 3C 3C 3C      532                     DB      000H,000H,03CH,03CH,03CH,03CH,000H,000H ; D_FE
      00 00                   533
07F8  00 00 00 00 00 00      534                     DB      000H,000H,000H,000H,000H,000H,000H,000H ; D_FF
      00 00                   535
0800                          536     CODE    ENDS
                              537             END


                              1               PAGE,120
                              2               SUBTTL  END ADDRESS
0000                          3     CODE    SEGMENT PUBLIC
                              4     PUBLIC  END_ADDRESS
0000                          5     END_ADDRESS     LABEL   BYTE
0000                          6     CODE    ENDS
                              7             END
```